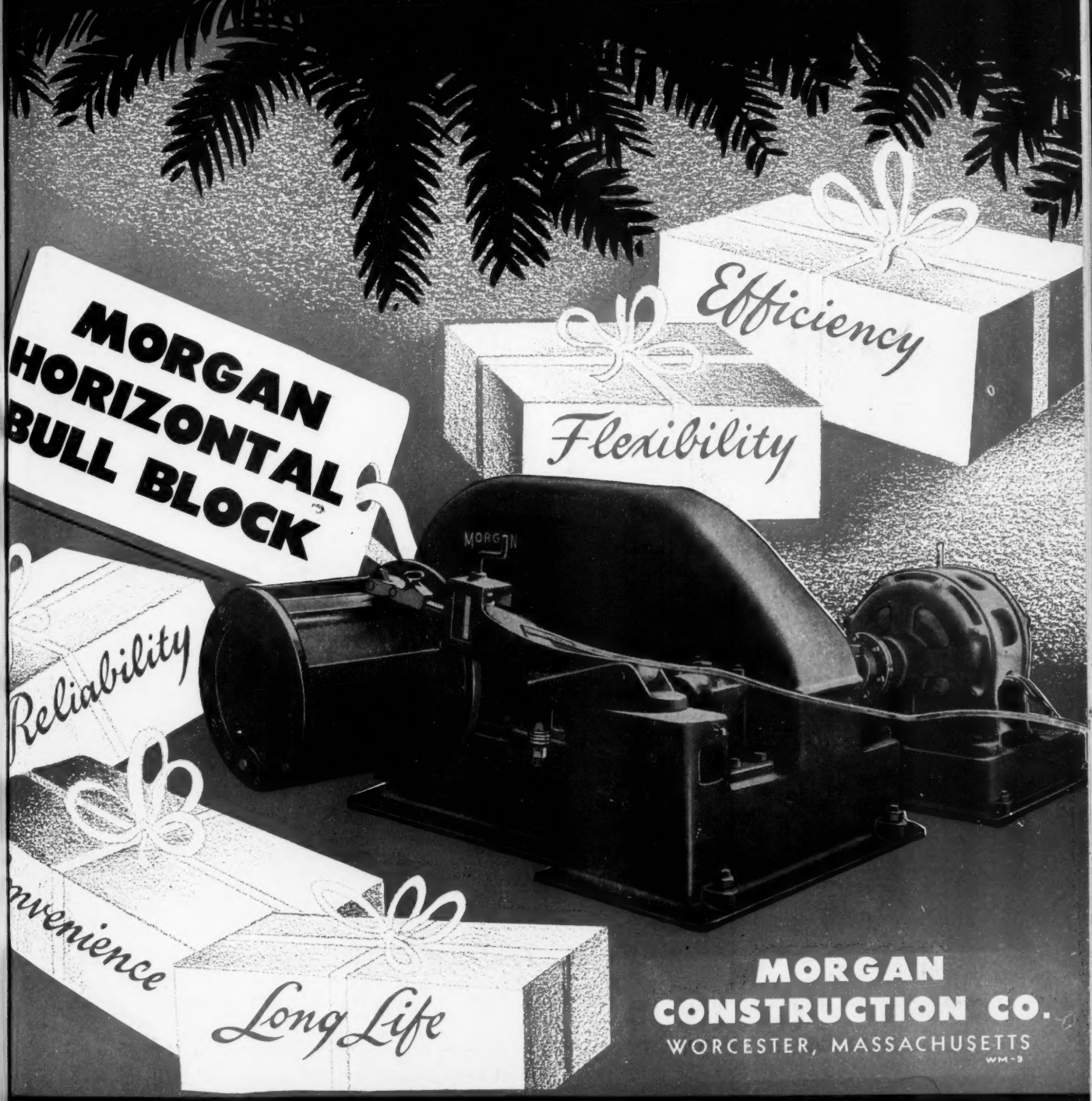
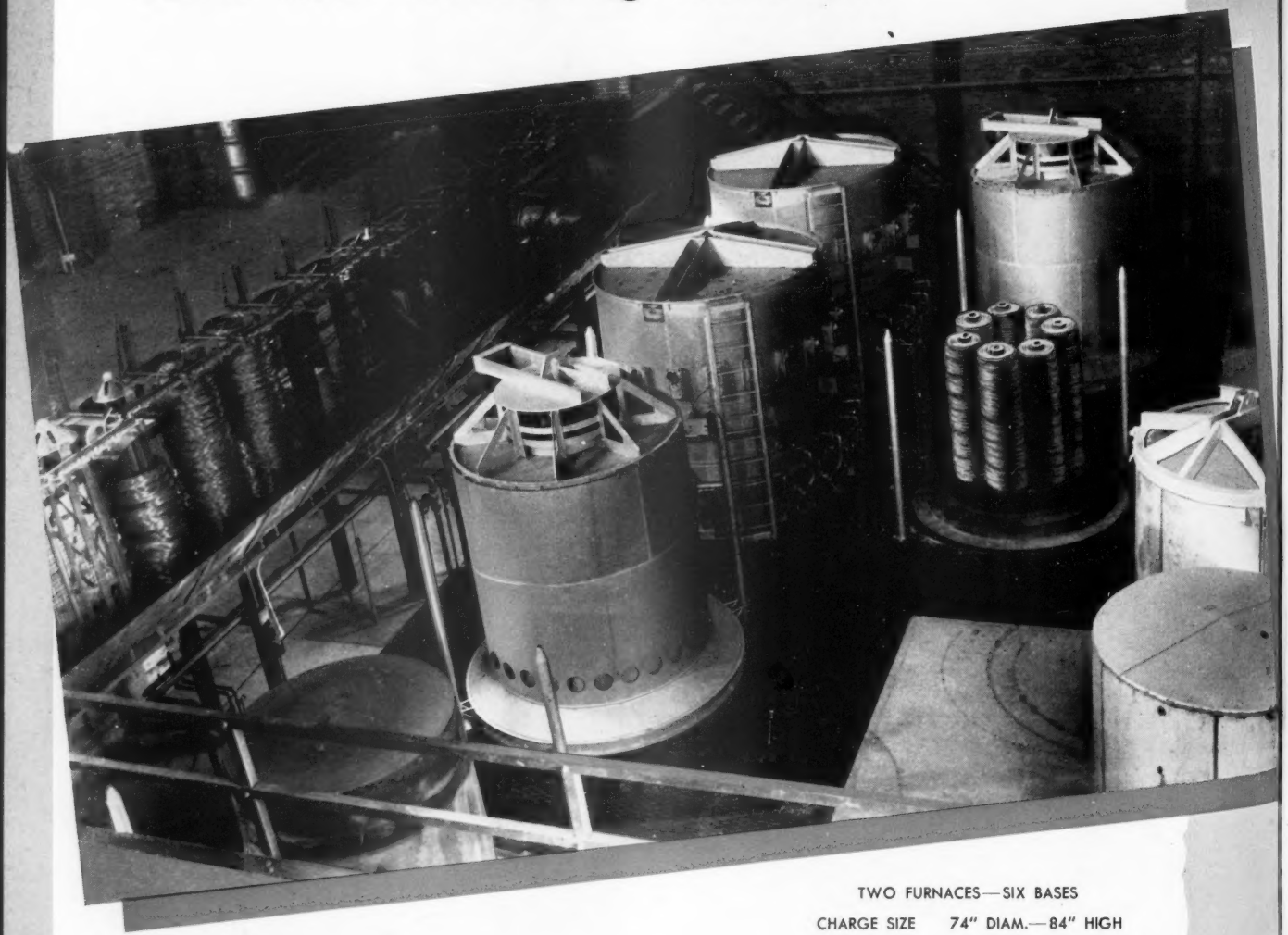
DECEMBER, 1946

WIRE AND WIRE PRODUCTS



FICIAL PUBLICATION OF THE WIRE ASSOCIATION

At the Pueblo, Colorado plant of the Colorado Fuel & Iron Corporation there are 2 more WILSON multiple stem wire annealing furnaces.



TWO FURNACES—SIX BASES
CHARGE SIZE 74" DIAM.—84" HIGH

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Lee Wilson **ENGINEERING CO., INC.**

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"We've found Carboloy 'Complete Package' Die Service really pays!"

Week after week, we hear reports like this. Companies large and small are finding Carboloy "Complete Package" Die Service the way to bigger savings. And here are the reasons why:

FIRST—Our "Complete Package" service gives you 4 valuable extra services that cost you nothing. (Complete details, below.) These services help your mill earn more—they save you money—they boost the efficiency of both men and machines.

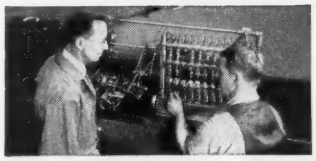
SECOND—Carboloy Cemented Carbide Dies give longer life—they produce a fine surface finish—they reduce "rejects"—they lower cost-per-piece—and permit closer tolerances on drawn parts.

Added up, doesn't "Complete Package" Die Service figure as a mighty good buy?

Carboloy Company, Inc., 11171 E. 8 Mile Blvd., Detroit 32, Michigan

TOP QUALITY DIES PLUS 4 VALUABLE EXTRA SERVICES!

at no extra cost!



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Here's "double-help" for you: Completely equipped Die Service Centers (in Detroit, Chicago, Pittsburgh & Thomaston)—AND expert field Engineers—both available to help you in servicing or finishing dies.

LOCAL STANDARD STOCKS TO SUPPLY YOU PROMPTLY

A great aid to you in maintaining production schedules! Stocked in Detroit, Los Angeles, Pittsburgh, Chicago and Thomaston, Conn.—assuring speedy delivery in metal-working areas coast-to-coast.

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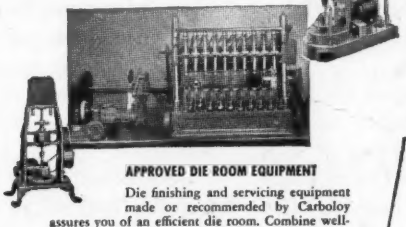
In Carboloy's Die Training School in Detroit, your die room personnel receive thorough training in carbide die application and maintenance methods. Up-to-the-minute training for newcomers or seasoned veterans!



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Die finishing and servicing equipment made or recommended by Carboloy assures you of an efficient die room. Combine well-trained personnel with high-efficiency equipment and it spells fast die finishing in *your* mill.

—here's **TIME-SAVING HELP!**

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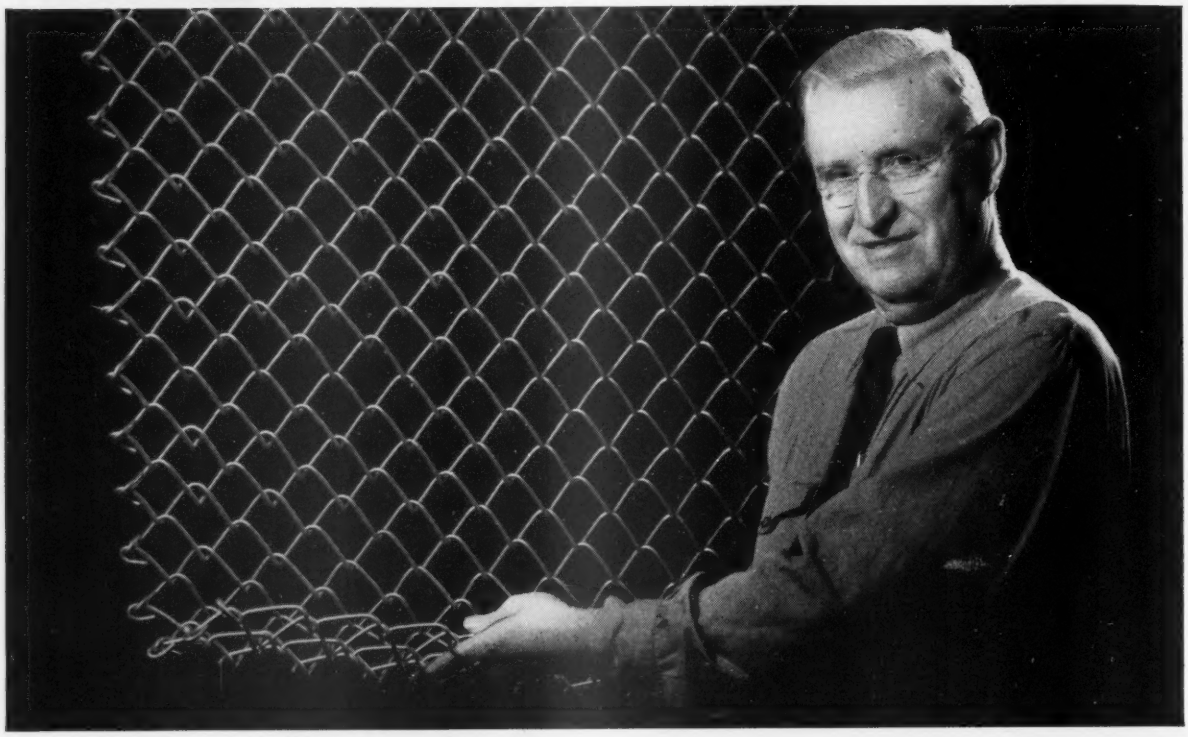
Specify CARBOLOY (TRADEMARK) CEMENTED CARBIDES { For "Complete Package" Die Service

Chicago • Cleveland • Detroit • Houston • Los Angeles • Milwaukee • Newark • Philadelphia • Pittsburgh • Thomaston, Conn.

Authorized Distributors: **Hartley Wire Die Co., Thomaston, Conn. • Michigan Wire Die Co., Detroit, Michigan**

Tough Forming Jobs?



Give Me Bethanized Every Time

Many wire fabricators know from experience that it pays to use bethanized wire for difficult forming operations. For this high-grade wire can really take it.

Bethanized wire forms easily because of the remarkable ductility of the bethanized coating of 99.9 per cent pure zinc, and its tight adherence to the steel base. Applied by an advanced electrolytic process, the zinc is locked so tightly to the steel base that the two metals—zinc and steel—become practically as one.

Proof of the ductility and tight adherence of the bethanized coating? Bethanized wire can be bent back flat upon itself . . . twisted . . . wrapped around its own diameter . . . even drawn to fine gauge. Yet so ductile is this superior zinc coating that it passes these tests with flying colors—without peeling or flaking.

Besides its ability to take severe forming, bethanized wire offers excellent corrosion-resistance, due to the uniformity and purity of the coating. Uniform around as well as along the wire, the coating is completely devoid of rust-inviting thin spots. Where protection against exceptionally severe corrosion conditions is needed, bethanized coatings can be applied in weights up to three times as heavy as those called for in conventional Type 3 galvanizing.

Why not investigate bethanized wire at your first opportunity . . . then give it a real workout? Complete details are yours for the asking.

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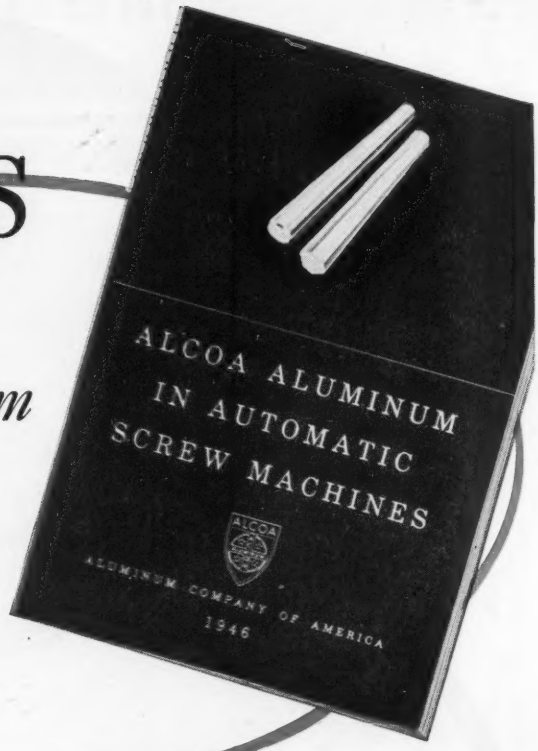
BETHANIZED WIRE

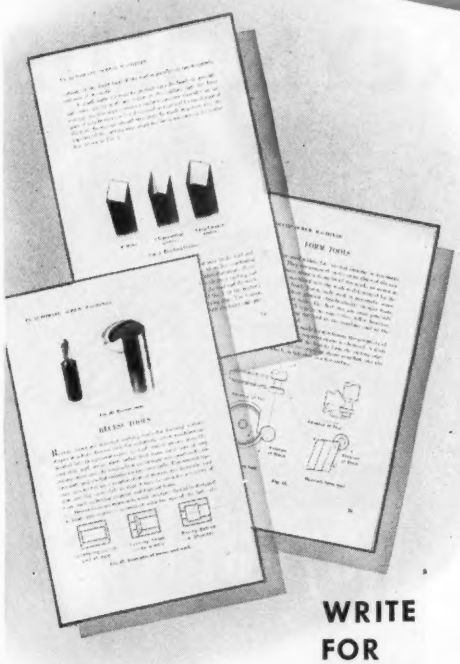
★ BETHLEHEM STEEL ★

WIRE & WIRE PRODUCTS, Vol. 21. No 12, December 1946. Publication Office, at Cliff St. New York 7, N. Y. Executive Office, 300 Main St., Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown President; R. S. Spengel, Sec. and Treas. Subscription price: U. S., $5.00; Canada, $5.00 per year, 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, June 14, 1946, at the Post Office, New York, N. Y., under Act of March 3 1879.

87 pages

to help you use Alcoa Aluminum in Automatic Screw Machines





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A letter will bring you a copy of "Alcoa Aluminum in Automatic Screw Machines". Address ALUMINUM COMPANY OF AMERICA, 1828 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in principal cities.

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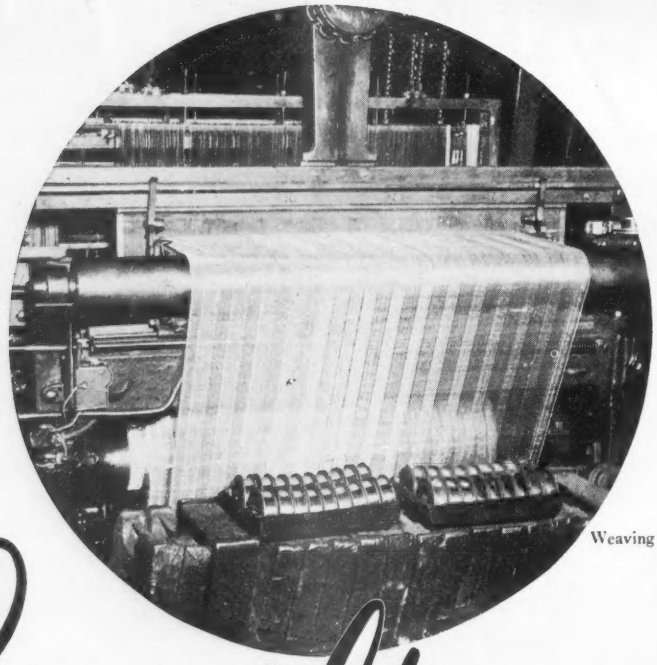

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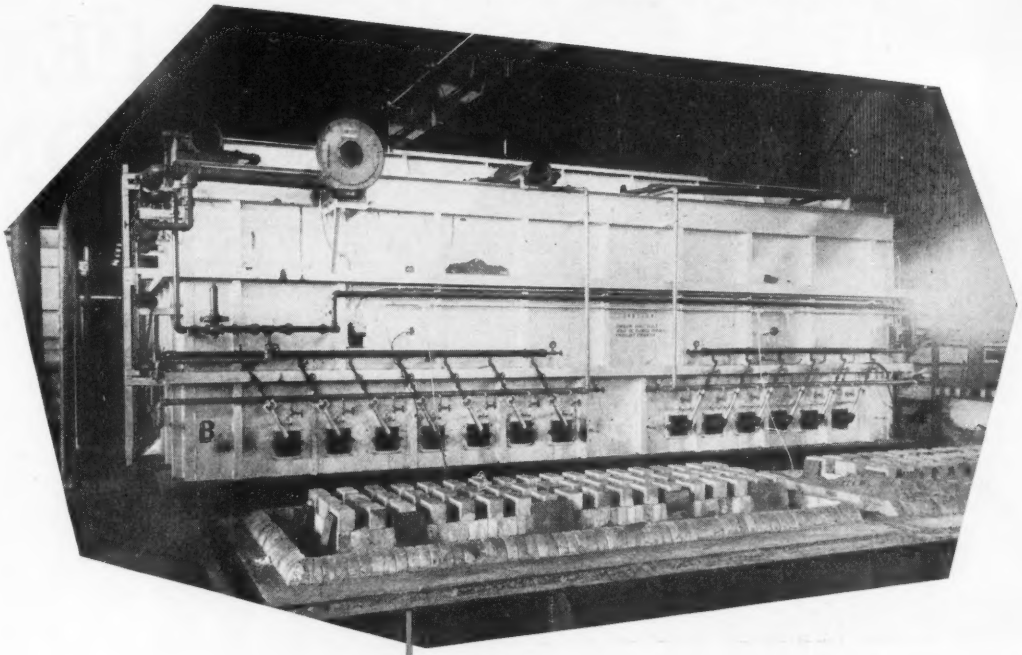
FROM YOUR PRESENT EQUIPMENT?



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The above cover annealing furnace for sheets in a representative steel plant was converted to our Direct Fired Combustion System and immediately resulted in an increase in production of over 50%, eliminated top stickers and improved metallurgical quality. At the present time every furnace in this department has been converted to our system. We ought to be able to do the same for you.

This increase in production is possible because we have introduced new principles of heat application in the metals producing field. These principles are applicable to the Wire, Rod, Sheet, Strip, Bar and Galvanizing Industries. For applicability of F.E.I. Direct Fired Combustion Systems to your present equipment write, wire or phone for further information.

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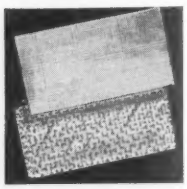
3 TAPE QUESTIONS

HOW MANY CAN YOU ANSWER?

General Electric spares no expense or effort to produce the finest cable tape obtainable. Each step in the intricate production is carefully supervised. The G.E. laboratories do your experimenting for you, and they make certain that the tape you use is the best tape for the job. General Electric emphasizes quality control. This is your assurance that all G-E cable tape is uniform and conforms to specifications. For further details write to Resin and Insulation Materials Division, Chemical Department, General Electric, Schenectady 5, N. Y.

CABLE TAPE

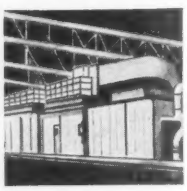
QUESTION NO. 1: How does sizing affect a cable tape's insulating qualities?



ANSWER

It affects it greatly. Too much sizing means less varnish impregnation—and it is the varnish that insulates, not the sizing. The cloth used in G-E cable tape contains just the right amount of sizing to permit maximum varnish impregnation.

QUESTION NO. 2: What advantages are there in pre-testing cable tape:



ANSWER

Pre-testing brings to light any flaws in the cloth itself. Mechanical and dielectric strength can be accurately determined before the tape is used, and resistance to chemicals and moisture can be established to help guarantee long and efficient service life. Each lot of G-E tape is carefully pre-tested to make certain that it has all the important insulating values.

QUESTION NO. 3: How does a tape affect your cable business?

ANSWER

Naturally a good tape helps insure a high quality cable. G-E cable tape more than meets I. P. C. E. A. standards. It is extremely easy to apply because it is soft, pliable, and of uniform width and thickness.

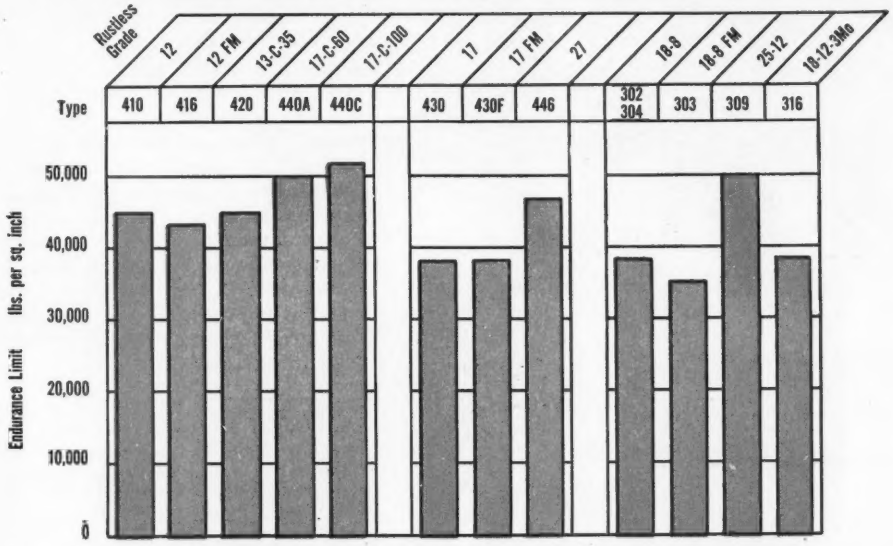
GENERAL ELECTRIC

CD46-T6

RUSTLESS DATA SHEET NO. 9

Corrosion Resistance Plus Resistance to Fatigue

One of the Many Combinations of Properties Offered by Stainless Steels



METALS get tired. Under many repetitions of stresses metals become fatigued, and are not able to endure loads indicated as safe by the usual static tension and compression tests. When corrosive conditions are severe, this danger is exaggerated, causing a substantial drop in the safe loading stress. Stainless steels, however, show higher endurance limits or resistance to fatigue under many conditions, and will outperform other engineering materials under any number of repeated stress cycles.

Endurance limits have been established to indicate the safe loading stress which a material can withstand under an unlimited number of repeated stress cycles. Endurance limits are used in the design of moving machine parts such as pump shafting, aircraft controls, springs and instrument parts where loads are applied in repeated cycles—from maximum to zero, or from maximum tension to maximum compression. Endurance limits vary for different materials and for different conditions of that material. Endurance limits are closely related to tensile strength and usually approximate one-half the ultimate tensile strength. Therefore, any treatment which alters the tensile strength, also alters the endurance limit. Values of endurance limit indicated in the above chart represent stainless steels in the annealed condition and, therefore, are the minimum values to be expected. Hardening either by cold work or by heat treatment will raise the endurance limit to a considerable extent. Stainless steels not hardenable by heat treatment can be cold worked to obtain endurance limits approaching 100,000 pounds per square inch. Stainless grades hardenable by heat treatment go even higher. Types 420, 440A and 440C, when hardened and stress relieved, offer endurance limits well over 100,000 pounds per square inch—higher than many straight carbon steels, and much higher than any other standard engineering material.

There are many factors which affect fatigue and make it a complex subject. Scratches, machine marks, nicks, dents, and other surface irregularities form stress concentration points and promote the progressive failures which are characteristic of fatigue. Temperature has a pronounced effect on fatigue. Corrosion, in combination with fatigue, has extreme effects usually predictable only by studies of service performance. Fatigue is a subject requiring special attention. When you want to use stainless steel to resist corrosion fatigue, consult our specialists.

Automatic bottling equipment must withstand a severe combination of service conditions, and must be made of material of high fatigue strength—

For a complete report on why one prominent manufacturer uses stainless steels almost exclusively for this purpose, and how the hundreds of different parts are machined to rigid quality standards at high production rates—request a copy of Rustless' latest 3-page case history "Machining Stainless Steels by Preference."

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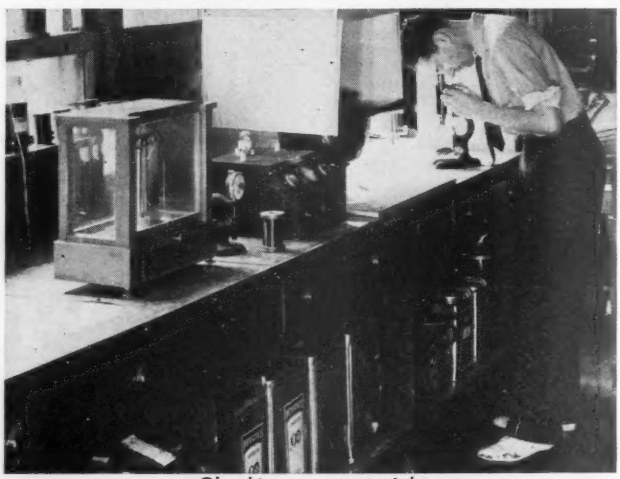
Mercury testing for continuity of film



Checking raw materials

Don't "fool around"... USE DEPENDABLE WIRE PRODUCTS!

A product, too, is only as strong as its weakest part. Follow the practice of leading designers and engineers by specifying only service-giving wire . . . wire that has built up a reputation for "delivering the goods under fire."

Hudson Wire products, designed for discriminating manufacturers, has just such a reputation in the fine wire field. Offering greater flexibility and tensile strength, perfect laying at higher speeds, new coating methods and reduced coil dimensions without sacrificing electrical values, Hudson Wire products will probably lower your production costs considerably. Check these three points:

QUALITY — **All phases of manufacture, from ingot to final processing, are carefully supervised and fulfilled in the same manner you would carry out in your own plant. There are no unimportant phases in the work.**

UNIFORMITY — **By mercury process tests, our engineers can guarantee perfect uniformity in wire; from the smallest to the largest order. No more variations in consistency, structure or electrical properties . . . every inch of wire exactly as specified, more than meeting your requirements.**

SERVICE — **If you have a wire problem, our complete design and engineering facilities are at your disposal without obligation. Send your specifications and blueprints for our recommendations; or if you are not quite ready, write for samples of these quality products.**

Enameled Copper, Enameled Iron, Enameled Alloy, Enameled Aluminum, Silk Covered, Cotton Covered, Celanese Covered, Glass Fibre Covered, Twisted Multiples, Parallel Multiples, and Litzendraht

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The hard work in the cleaning, drawing and handling of wire and rod has been made easy, fast and safe by application of Cleveland Tramrail equipment especially designed for the work.

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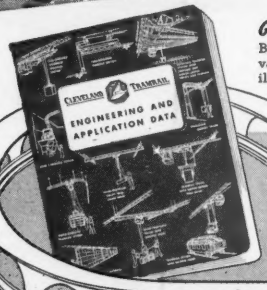
Today more producers and fabricators of wire and rod are enjoying the many advantages of Cleveland Tramrail than ever before and the list of prominent names in this industry is growing rapidly.

It costs you nothing to learn what Cleveland Tramrail can do for you, but it may be of tremendous importance in the immediate years ahead. Why not investigate now?



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"50% faster cutting, 100% longer wheel life" — **Surfacing broaches**

"Ground 30 high speed steel crank lathe tools compared to 23 tools for competitive wheel" — **Sharpening tools**

"Ground 3600 pieces per wheel compared with 1200 to 1500 previously" — **Surfacing cast iron with segments**

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And here's why 32 ALUNDUM abrasive is cutting costs —

1. The unique electric furnace process which eliminates crushing produces grains with many sharp points for faster, cooler cutting.

2. Because the grains are over 99% pure fused alumina the many sharp points have exceptional resistance to dulling.

3. The rough, nubbly surface of the grains insures strong, uniform bonding for longer wheel life and fewer dressings.

Put 32 ALUNDUM grinding wheels to work cutting costs for you.

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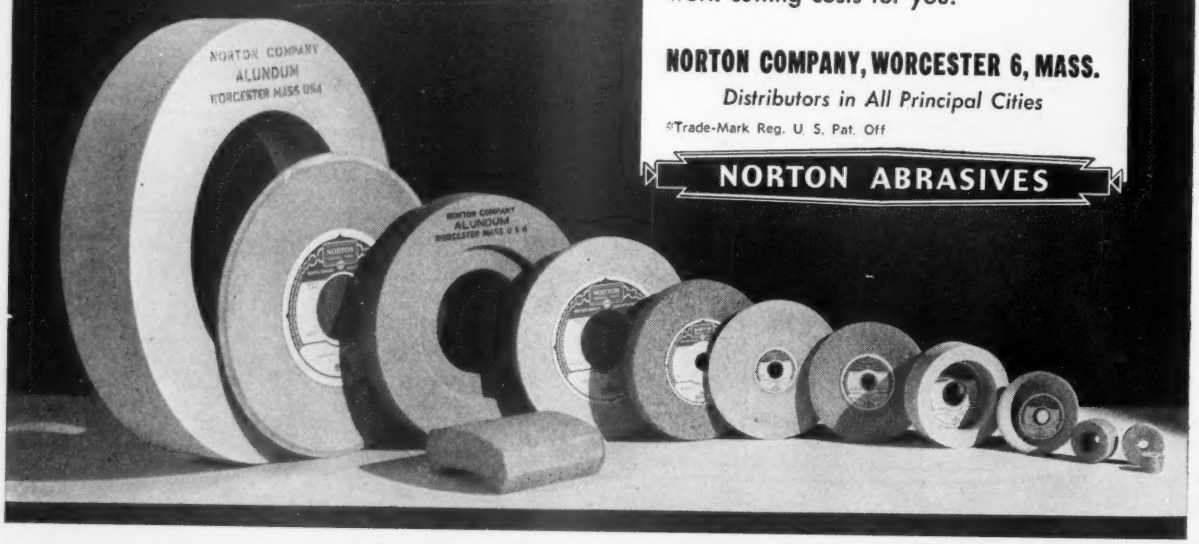

WHEN DIMENSIONAL ACCURACY IS IMPORTANT

... *Specify Roebling* ROUND WIRE!

YOU DON'T WRITE SPECIFICATIONS for the fun of it. You want a definite tensile strength, ductility and finish. You want a certain diameter from one end of the wire to the other. Here at Roebling we realize this . . . *and do something about it.*

Meeting specifications is the art of knowing how to make round wire . . . and knowing how to keep from making one of the hundreds of possible mistakes. Call it an art. Call it precision manufacture. It's both, here at Roebling.

We've had over a century to learn how to make such products as round wire . . . to meet exacting specifications. When it's important that they be kept to the last decimal, call on Roebling.

Then, too, if you have a particularly tough problem involving the use of round, flat or shaped wire or of *any* Roebling product, call in an experienced Roebling engineer. He's always ready to offer prompt, courteous, *effective* service.

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Wire Rope

Electrical Wires and Cables

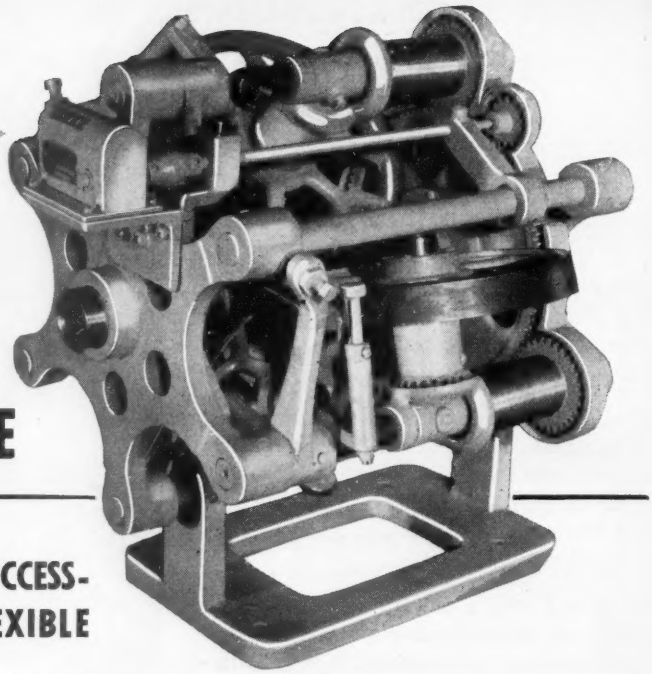
Woven Wire Fabrics

ROEBLING

PACEMAKER IN WIRE PRODUCTS

JLE

Class LV
MEASURING MACHINE



THE ONLY MACHINE MADE THAT SUCCESSFULLY MEASURES WIRE ROPE, FLEXIBLE CONDUIT AND TWISTED PAIR! . . .

THE JLE CLASS LV MEASURING MACHINE . . .

— gives you mechanically exact linear measurement of all kinds of wire rope, flexible conduit and twisted pair, also gives accurate measurement of smooth conductors or materials both round and oval . . . eliminates entirely the danger of short measure.

Measurement is shown on an easily read quick-set counter in full view of the operator.

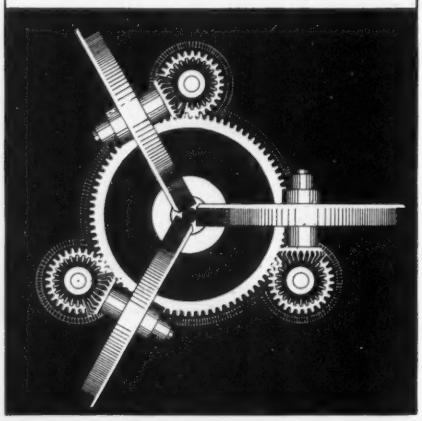
Adjustments for varying sizes and shapes of materials is automatic.

The machine will not injure soft surface or insulation.

Several sizes of the Class LV Measuring Machine are available with capacities up to 2". Each LV Machine can be equipped with a large variety of counters.

No Vibration

LV Machine will not vibrate or slip on any material, including twisted stock, regardless of speed of operation.



Write Now for complete details and specifications on the LV and other JLE Measuring Machines for the linear measurement of wire, cable, cord, rope, tubing, sheet textiles, braids, zipper stock, chain, extruded metal or plastic shapes, etc.

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So, if your product is intended for the housewife and can be made of wire, make it of Stainless Steel and you give it added value and irresistible sales appeal.

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And this is important — U·S·S Stainless Steel Wire for such applications is available NOW—for *immediate* delivery — in any quantity desired.

Our wire specialists will gladly help you in applying this perfected, service-tested Stainless Wire to your product—to insure greatest economy in manufacture and utmost satisfaction in service. Write us.

If you make it of WIRE... make it of the BEST!

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San Francisco · Los Angeles · Portland · Seattle · Salt Lake City

Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
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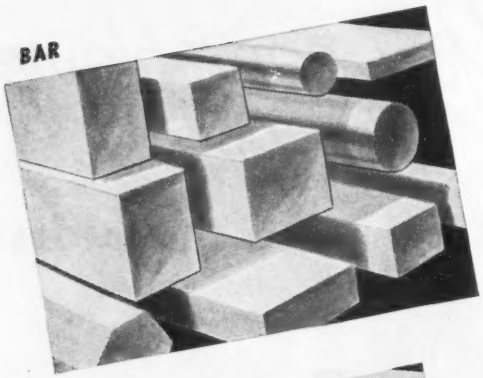
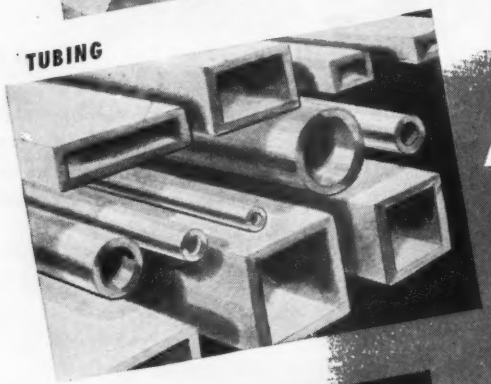
★ UNITED STATES STEEL ★

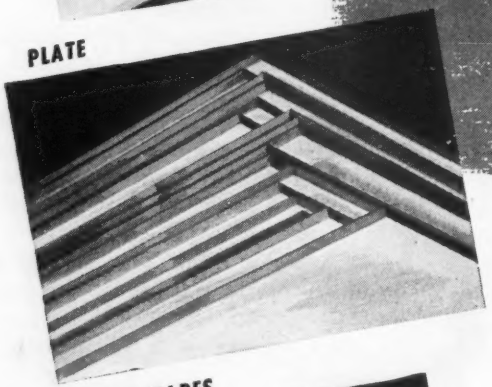
BAR



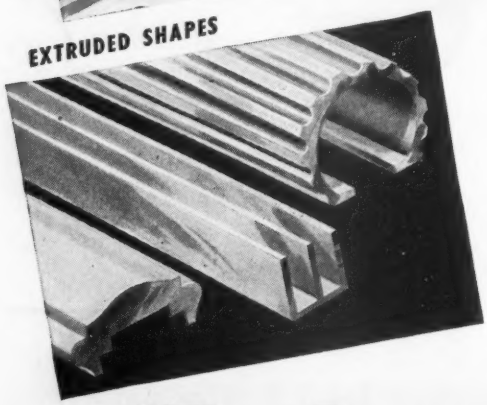
TUBING



PLATE



EXTRUDED SHAPES



ALUMINUM MILL PRODUCTS

AVAILABLE TO FABRICATORS right now!

Consider your aluminum needs—then get in touch with your nearest War Assets Administration Regional Office to see if we can fill your requirements. Even your highly specialized requirements might be filled from WAA surplus stocks. It costs nothing to find out. Orders are filled quickly and without fuss.

All metals are sold under existing priority regulations. VETERANS OF WORLD WAR II are invited to be certified at the War Assets Administration Certifying Office serving their area, and then to purchase the materials offered herein.

Exporters are considered as wholesalers in the purchase of surplus property. Any question on export control should be referred to Office of International Trade, Department of Commerce, Washington, D. C.

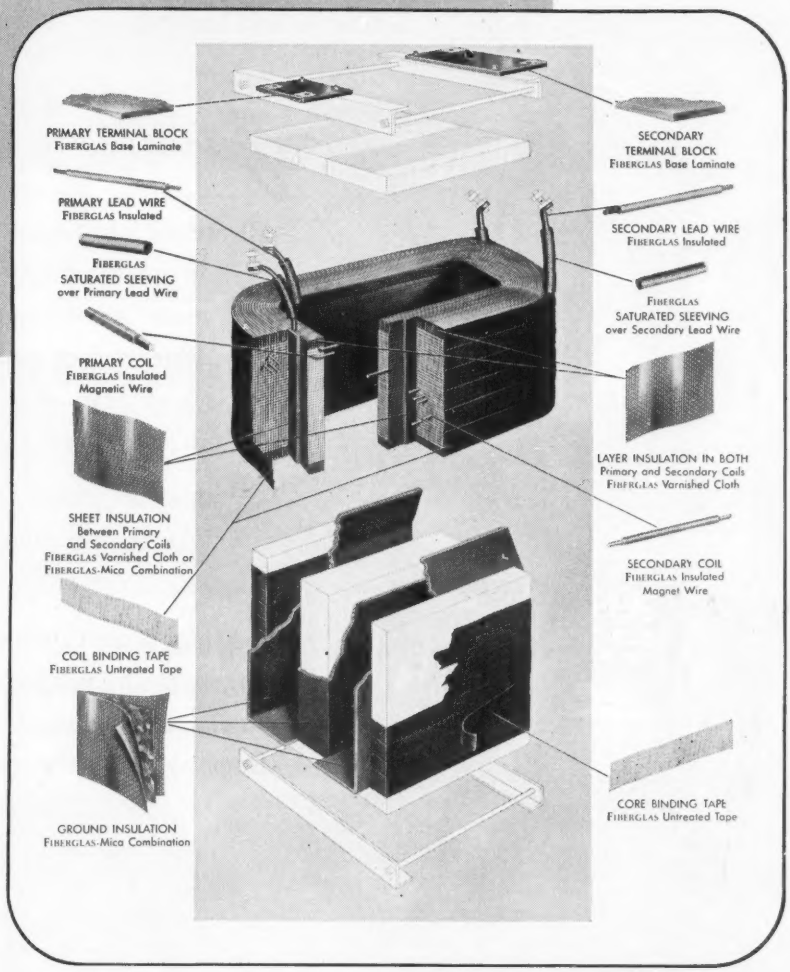
WAR ASSETS ADMINISTRATION

GOVERNMENT OWNED SURPLUS

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Fort Worth • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • New York • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane • Tulsa

157-9

Why Fiberglas Electrical Insulations are used in Dry-Type Transformers



Substantially smaller and lighter weight transformers are made possible by the excellent electrical properties of Fiberglas and its ability to withstand the effects of heat and moisture!

Dry-type transformers, when insulated with Fiberglas and organic resins, are up to 25% smaller and 38% lighter in weight than transformers insulated with organic materials. Further reductions in size and weight are possible when Fiberglas and silicone resins are used. High operating temperatures are possible without affecting the tensile strength or basic properties of Fiberglas, and hot-spot temperatures are lower because of the high thermal conductivity of the glass textiles.

Fiberglas-insulated transformers can be installed anywhere—indoors or out; fire hazards are reduced; maintenance costs are minimized; greater overloads and surges are permitted.

Any one of the basic Fiberglas advantages may solve your electrical equipment problems. There is a type of Fiberglas material to meet almost every electrical insulation need. Be sure to have complete information about all types of Fiberglas electrical insulating materials at hand. Write for Catalog EL46-11, Owens-Corning Fiberglas Corporation, Dept. 858, Toledo 1, Ohio. Branches in principal cities.

In Canada: Fiberglas Ltd., Toronto, Ont.

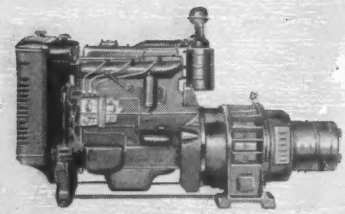
Fiberglas is the trade name for these electrical insulation materials and many other products made from fine, strong, pliable, moisture and heat resistant, ageless *glass fibers*.

OWENS-CORNING
FIBERGLAS

Your most logical buy

SURPLUS ELECTRICAL EQUIPMENT

from WAA



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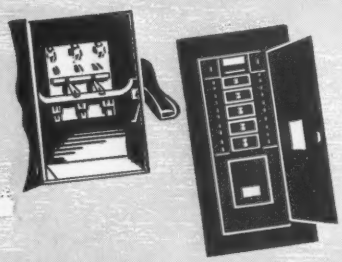
Alternating and direct current, unused and in good condition. Also a wide variety of used sets.



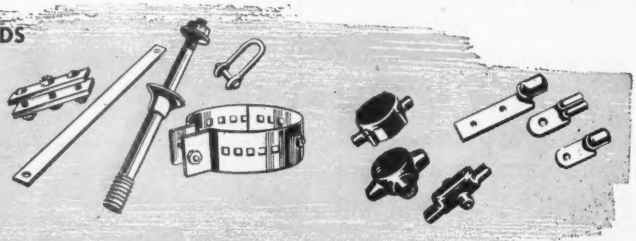
PANEL BOARDS AND SWITCH BOARDS

For lighting and appliance circuits. All electrical services and voltages.

Electrical jobbers and contractors will find a ready market for the many types of electrical equipment and materials offered by War Assets Administration. Since prices on this equipment are below the current market, every item will fill an urgent need and at a very real saving.

Industrial concerns may also acquire their electrical needs through any of the WAA Regional Offices.

Many scarce items are included in this sale. Act now to secure needed supplies and build up depleted stocks. All you need do is call or write your nearest Regional Office for complete information and prices.



Priority purchasers have previously had an opportunity to fulfill their needs.

Purchasers of Pole-line Hardware for power must make certification required under Housing Expediter Priority Regulation 2.

These materials are available for export. Any question on export control should be referred to Office of International Trade, Department of Commerce, Washington, D. C.

POLE-LINE HARDWARE

Many items of hardware for transmission, distribution and communication lines. Including: Pins, brackets, braces, bolts, clamps, hooks, rings, etc. Unused and in good condition.

WIRING DEVICES

Hundreds of items for wiring systems, including attachment plugs, connectors, connector bodies, conduit fittings, outlets and switches.

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691-4

Vaughn

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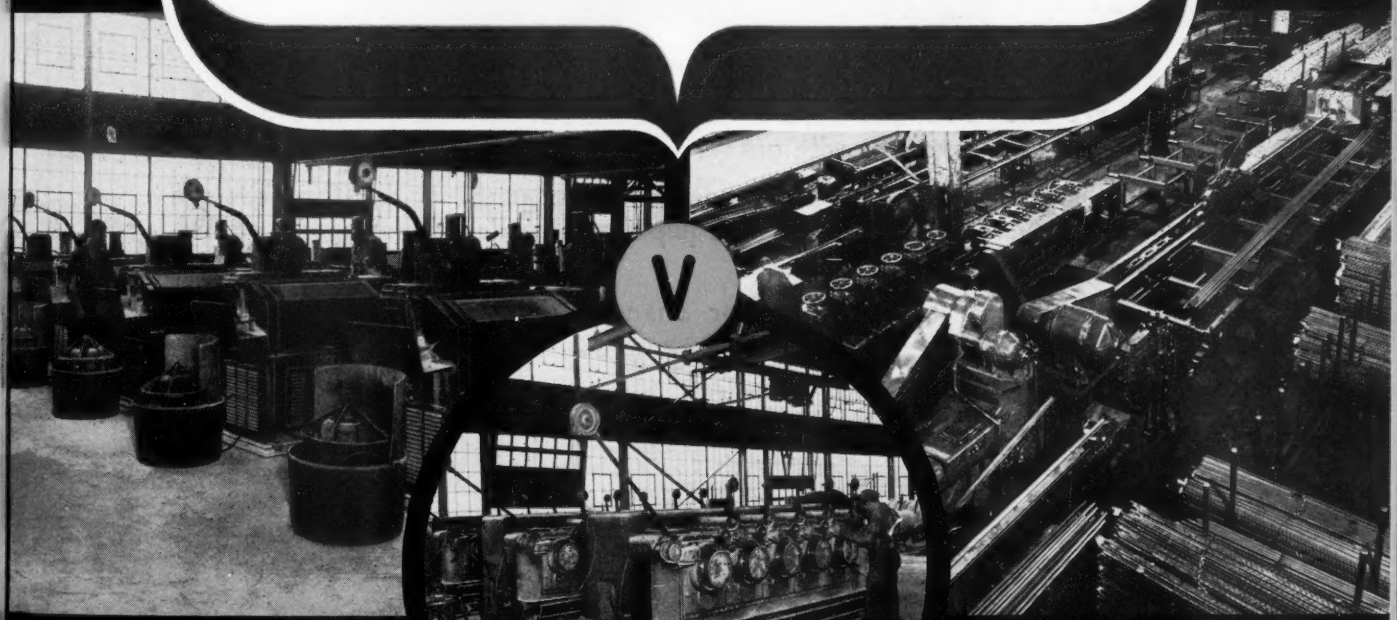
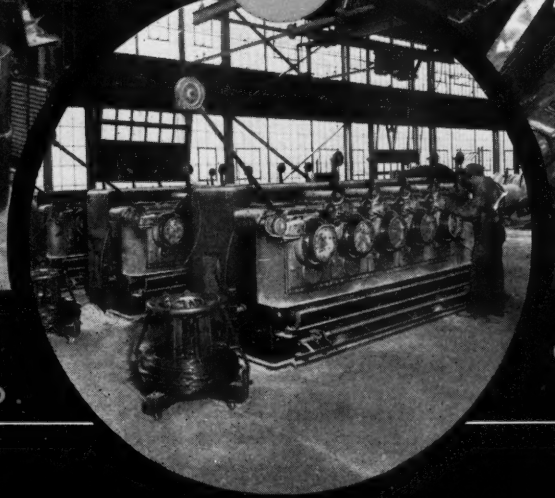
FOR THE LARGEST BARS AND TUBES . . .
FOR THE SMALLEST WIRE . . . .

Ferrous, Non Ferrous Materials or Alloys

In short, your every requirement for dependable, productive Cold Drawing Equipment is met in the complete VAUGHN Line. Let us cooperate with you on your current drawing problems.





THE VAUGHN MACHINERY CO.

CUYAHOGA FALLS, OHIO, U.S.A.

CAPSTAN UNITS

We offer a complete line of capstan units of both the double drum type and the single drum type with grooved idler fleeters as illustrated.

These capstans are designed to suit every purpose, and the units are used in connection with insulating equipment of various types or with stranding and cabling equipment.

Variation in speed by either change gears or by variable speed transmissions.

Sizes from 14" diameter to 96" diameter.

Let us design a capstan unit to meet your requirements.

WRITE FOR DETAILS

NEW ENGLAND BUTT COMPANY

ESTABLISHED 1842
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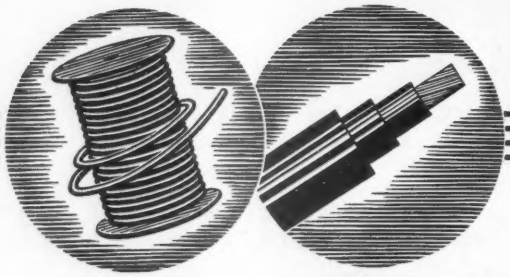
PROVIDENCE 7, RHODE ISLAND, U. S. A.
JAMES DAY (MACHINERY) LTD., "FORD HOUSE." 88 REGENT ST., LONDON., W. I. ENGLAND

We extend to the members of the Wire Industry our sincere regards and our best wishes for The New Year

STANDARD INDUSTRIAL COMPOUNDS CO.
CHICAGO, ILLINOIS

SPECIALIZED RESEARCH EXPERIENCE



In All Types of Insulating Finishes and Impregnating Materials.

All Formulations made to individual specifications and to meet unusual requirements.

Our Hot-melt, Flame-resistant Compounds are non-toxic.

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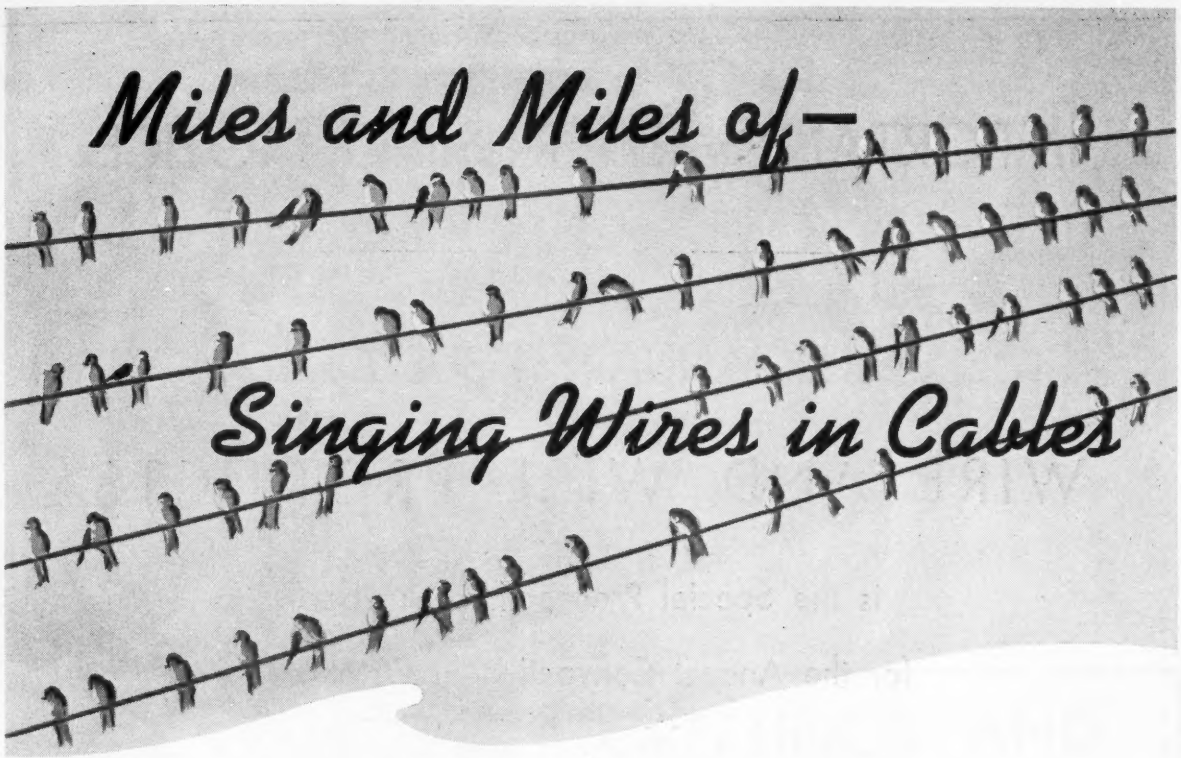
Engineers of Product Finishes

NEW YORK - CHICAGO

SERVING INDUSTRY FOR 75 YEARS



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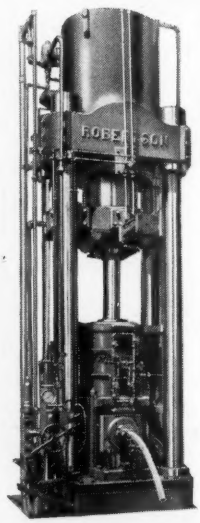
ROBERTSON ENGINEERED PRESSES



In 1882, John Robertson added another great development to the then well-known Robertson line—the first lead encasing equipment. In the more than 60 years since, the Robertson Company has improved its design and capacity to meet the ever-increasing and exacting demands of electric cable and hose manufacturers.

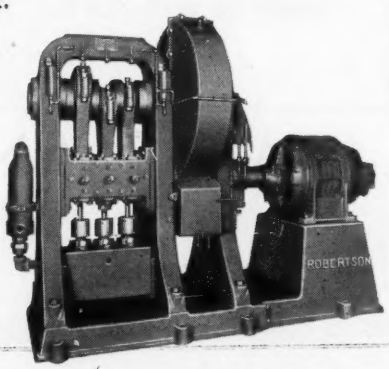
Today, there is a Robertson Hydraulic Pump—a Robertson Extrusion Press—a Robertson Accumulator—as well as a dozen other pieces of special Robertson equipment—all designed and built to give high operating efficiency, with low maintenance cost. Today, a long list of manufacturers (among them, Western Electric, General Electric, Anaconda, Roebling, and many others) attest to the quality and performance of Robertson Equipment.

JOHN **Robertson**
COMPANY, INCORPORATED

125-135 WATER STREET, BROOKLYN 1, NEW YORK

Designers and Builders of all Types of Lead Encasing Machinery

Since 1858



IMPORTANT ADVERTISING NOTICE

◆ ◆ ◆

THE JANUARY ISSUE OF

WIRE AND WIRE PRODUCTS

is the Special Proceedings Number

for the Annual Convention in October

This post-convention issue has extra advertising values because it contains:

1. The discussions on the technical papers recorded at the Convention.
2. The Mordica Memorial Lecture given by Fred M. Crapo, President of the Indiana Steel & Wire Company, the subject of which was "Galvanized Steel Wire."
3. Other special features, including a list of those who attended the Convention.

If you have not placed your special advertising order for January, please send it at once. Forms for January close December 15th.

Send your orders to

WIRE AND WIRE PRODUCTS

Phone: Stamford 3-0482

300 MAIN STREET STAMFORD, CONN.

GREETINGS AND BEST WISHES FOR 1947

Things look good for 1947. By that time practically all war-time controls will be off . . . . and, we hope, labor troubles will be greatly lessened. Raw materials and supplies in general should begin to come through in greater volume and production should run more smoothly.

So . . . . here's best wishes for the New Year: Let's all pull together to make it a Happy one.

Apex Alkali Products Co.

MAIN AND RECTOR STS., PHILADELPHIA 27, PA. • PHONE: MAnayunk 8-3939

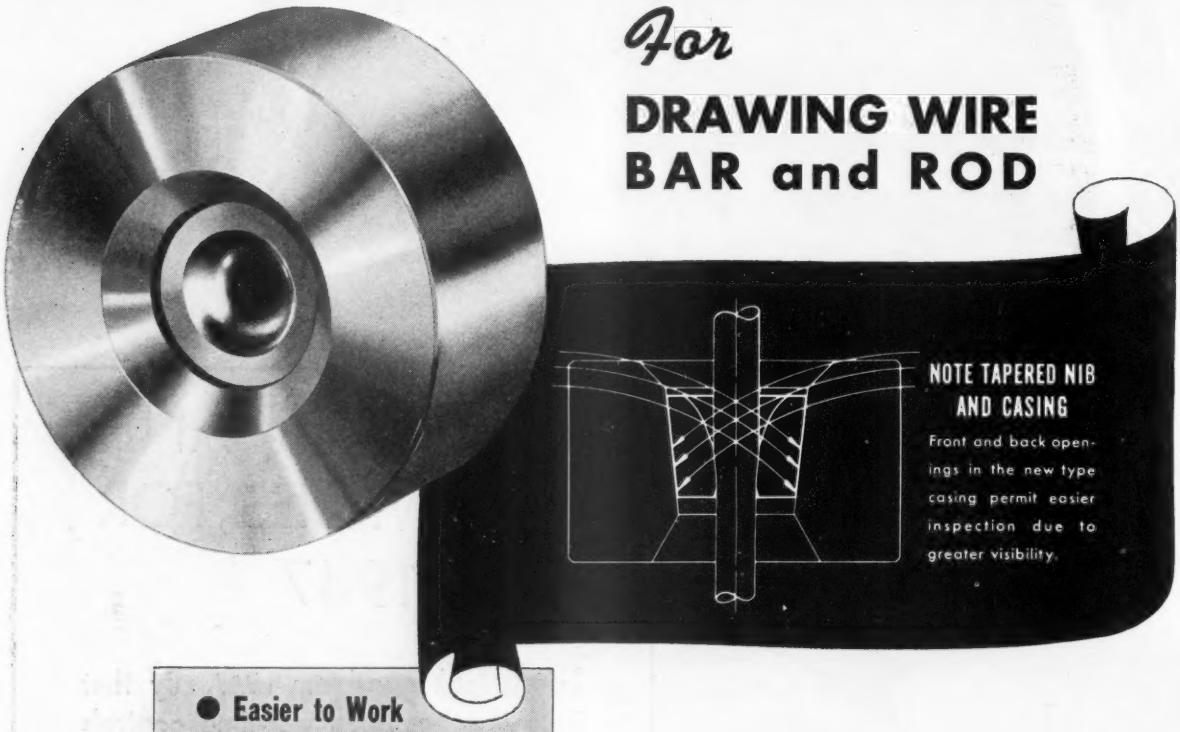
VASCOLOY–RAMET

Tantalum / Tungsten

CARBIDE DIES

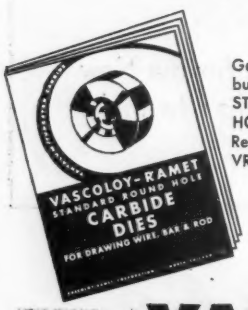
For

DRAWING WIRE BAR and ROD


NOTE TAPERED NIB AND CASING
Front and back openings in the new type casing permit easier inspection due to greater visibility.

- Easier to Work
- Greater Strength
- Time and Material Saver
- Better Lubrication
- Full Visibility

Maintain size longer and produce better finish. Tantalum/Tungsten Carbide has a lubricating characteristic which greatly reduces mechanical resistance in drawing, and in so doing, enables a much smoother finish. Many mills report longer productive life, less down time, greater tonnage per die and greater operator satisfaction. Write us for informative Bulletin VR348.



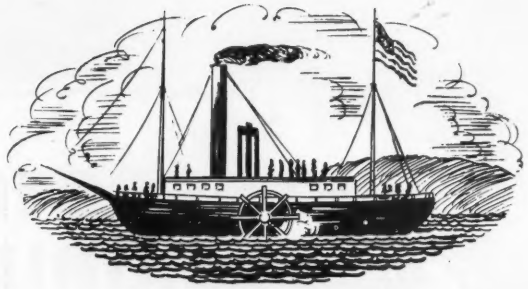
Get this helpful bulletin on STANDARD ROUND HOLE DIES. Request Bulletin VR348.

VASCOLOY Ramet RAMET CORPORATION

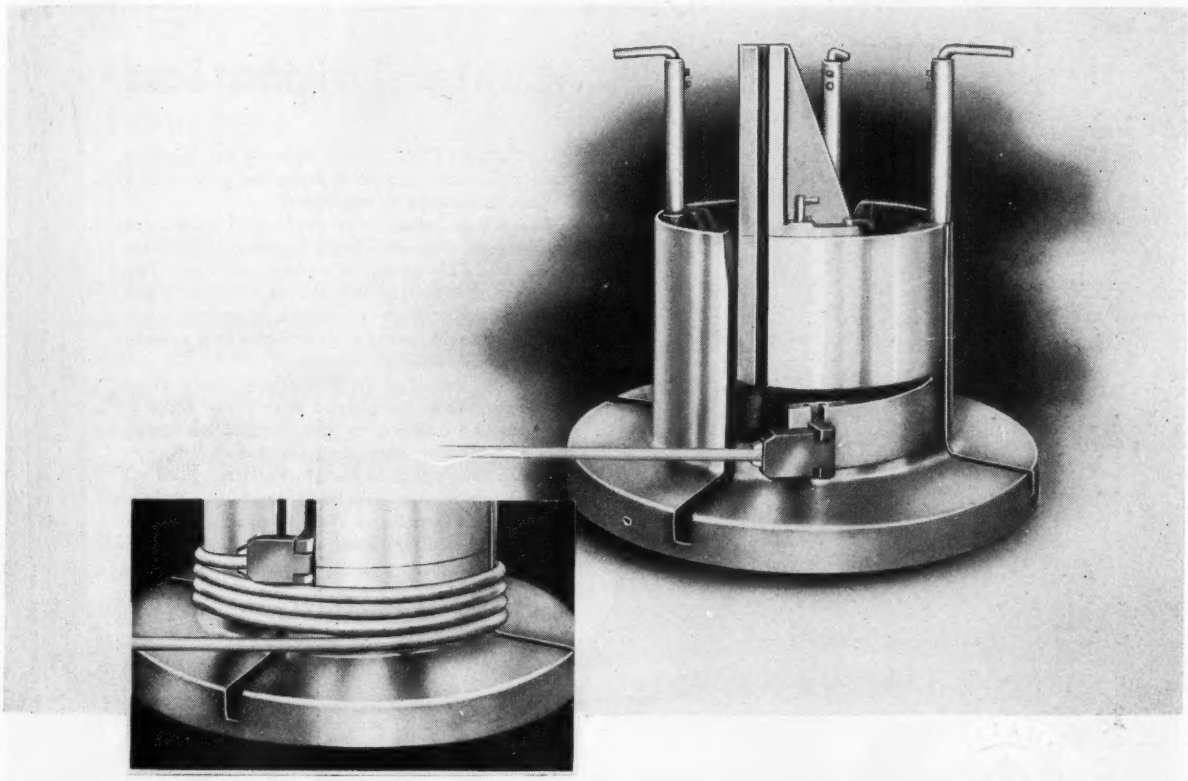
AN AFFILIATE OF FANSTEEL METALLURGICAL CORPORATION AND VANADIUM ALLOYS STEEL COMPANY

NORTH CHICAGO, ILLINOIS • SALES AND SERVICE IN PRINCIPAL CITIES

THE COURAGE TO BREAK WITH TRADITION



• Robert Fulton's steamboat was a great advance over the sailing vessels of his day. Fulton, like all true progressives, had the courage to break with tradition. • Here at Syncro, our engineers are encouraged to break with tradition. Resulting from this enlightened policy are many advancements, such as Syncro Automatic Pull-In Starting Clamps for Rodblocks which increase production, save time and labor, and eliminate scoring of drawing blocks. • When better, safer, more efficient methods can be found, Syncro breaks with tradition — and the entire wire industry benefits by the results.



SYNCRO MACHINE COMPANY

EXECUTIVE OFFICES AND GENERAL WORKS — 611 SAYRE AVENUE, PERTH AMBOY, N. J.

Machinery for the Wire Industry

SYNCRO

STRENGTH and FLEXIBILITY Always "Firsts" in Youngstown Rope Wire

When Lake Freighters Load

ANYTHING that speeds up loading and unloading increases freighter profits and improves service to customers.

That's one reason why preformed wire rope woven from Yolectro High Carbon Rope Wire is so widely used in crane service. The strength, flexibility and uniform gauge of the wire contribute to a strong, flexible rope which flows smoothly over sheaves and speeds up crane operation.

Specify Yolectro High Carbon Rope Wire for dependable, long-lived wire rope. Strong, flexible and uniform in gauge, this wire also has excellent corrosion-resistance properties and toughness to resist abrasion. Like all other Youngstown wire mill products, Yolectro High Carbon Rope Wire is produced from the finest quality steel, refined, rolled and drawn to exacting specifications.

QUALITY V YOUNGSTOWN SERVICE

Photo by courtesy of the Preformed Wire Rope Information Bureau.

YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

GENERAL OFFICES - YOUNGSTOWN 1, OHIO

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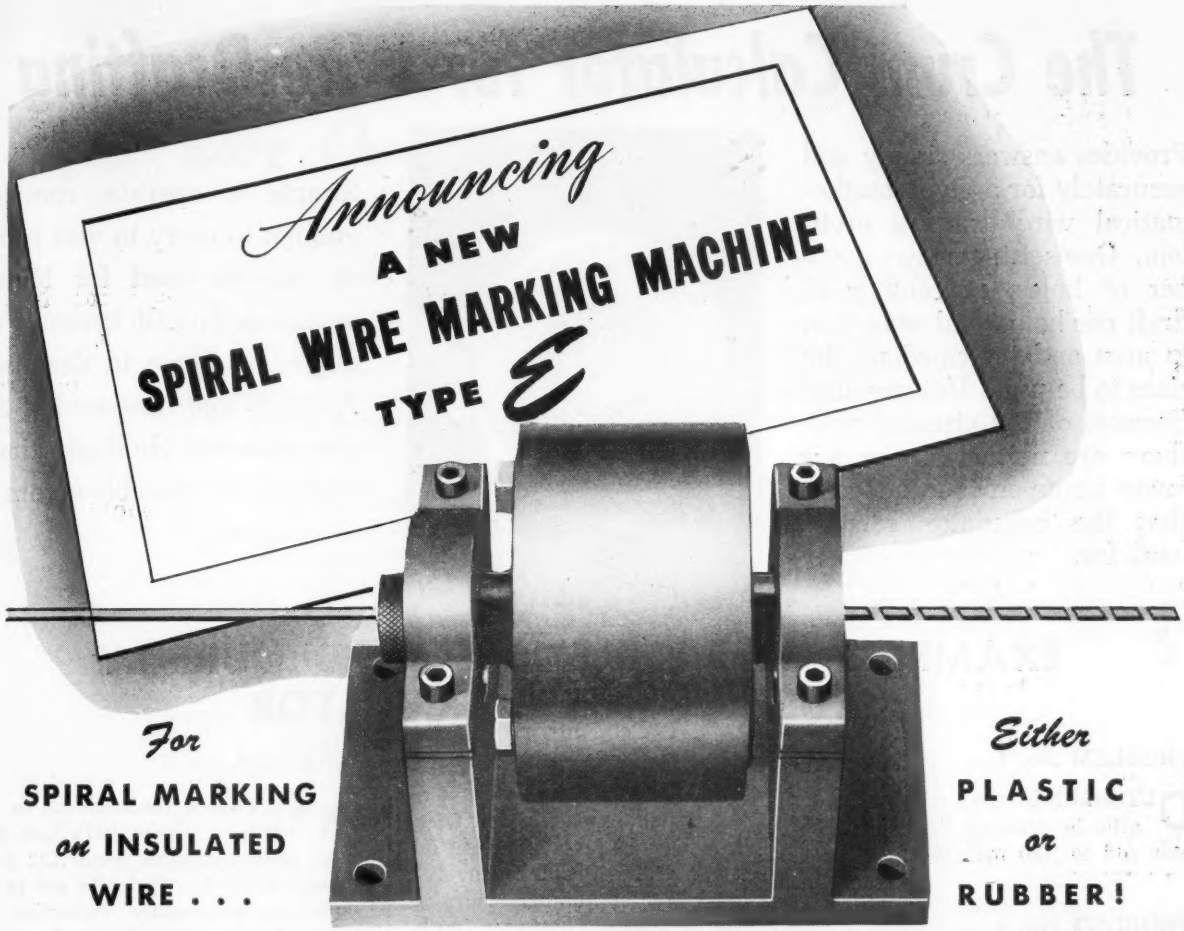
Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

Bars - Rods - Wire - Cold Drawn Carbon Steel Rounds - Electrolytic Tin Plate - Coke Tin Plate - Pipe and Tubular Products - Sheets - Plates - Conduit - Tie Plates and Spikes.



This is a new Wire Marking device that prints a helical stripe on insulation wire. A wide variety of colored inks are available, permitting multi-conductor cable to be made up from one basic insulation color, materially reducing the cost of strand identification.

Wire is fed through the Marking Machine at constant speed, the Marking Machine cylinder being driven by a belt at a constant speed, resulting in uniform pitch, helical stripe. The stripe may be applied to the wire during reeling operations or directly at the machine which applies the insulation.

Capacity of the Type E Machine is ⅜ inch O.D. wire. Constant-wire-speed takeup reel drives are available if required.

Approximately 15 colors are available for use with the machine, and by using two machines in tandem, coupled together, and employing two different colors, 285 color combinations are possible.

Ink may be added or its viscosity changed while the machine is in operation.

Ink can be prevented from drying by simply plugging exit and entry holes when shutting the machine down for the night.

Ask for... complete cost and specification details

JAMES L. ENTWISTLE CO.

43 CHURCH STREET, PAWTUCKET, RHODE ISLAND

World's Leading Manufacturer of Spark-Testing Equipment

Canadian Representatives:
THE A. R. WILLIAMS MACH. CO., LTD.
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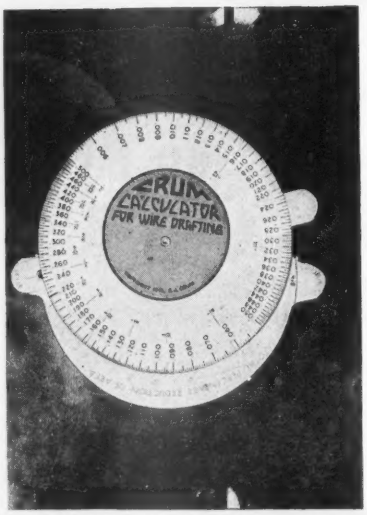
The Crum Calculator for Wire Drafting

Provides answers simply and accurately for a given mathematical wire drafting problem. One setting shows number of holes, percentage of draft per hole, total reduction in area and intermediate die sizes to be used. Universality: Because of the circular scale there are neither upper nor lower limits on the diameters that the calculator can be used for.

* * *



Simple to operate; compact enough to carry in vest pocket; can be used for Metric as well as English systems; all diameters given in decimals. A handy and time-saving device that will eliminate time-wasting and possible errors in calculations.

* * *

EXAMPLES OF PROBLEMS SOLVED QUICKLY BY USE OF THE CALCULATOR

PROBLEM No. 1

DETERMINE the reduction of area in drawing ¼-inch diameter rod to .120 inch wire.

PROBLEM No. 2

SUPPOSE that in Example 1 the tensile strength of the stock is such that the drawing process produces a tensile strength of 100,000 pounds per square inch in the .120 inch wire. To develop the same tensile strength in an .080 inch diameter wire, what stock size is required when the tensile strength of the stock is assumed to be the same as that in Example 1.

PROBLEM No. 3

IN the drafting of .0625 inch diameter wire to .025 inch, no single draft must exceed 21 per cent. Determine the minimum number of holes for this job.

* * *

THE Crum calculator is designed especially for wire drawing jobs involving eight or fewer drafts. Problems involving a greater number of drafts can be solved, however, with extra manipulation. For instance, if it is desired to set up a multi-draft machine to draw .0095 inch diameter wire from .0625 inch stock in sixteen drafts, the intermediate die sizes can be determined by the calculator.

PROBLEM No. 4

A CERTAIN five-block continuous wire drawing machine has a capacity permitting a draft of 33 per cent per hole on low carbon wire. For economic reasons it is desired to find the largest stock size that can be used when finishing .0455 inch diameter wire on this machine.

* * *

PROBLEM No. 5

A continuous machine is to be set up to draw .0375 inch tire bead wire six holes from .122 inch diameter stock. All drafts are to be equal in percentage reduction of area. Determine "a" the intermediate die diameters; "b" the per cent reduction of area per hole; "c" the total per cent reduction of area from start to finish.

PROBLEM No. 6

THE diameter of the finishing block of a double-deck wire drawing machine is twenty-four inches; the diameter of the first block, seventeen inches. The operator wishes to finish .142 inch diameter wire from No. 5 rod and therefore must determine (a) the minimum draft for the finished die, (b) the minimum first die size, (c) and the first die size when a slippage of ten per cent is allowed.

* * *

HOW TO ORDER

The price is $5.00 each. A discount of 10% on ten or more.

Send check or purchase order to

WIRE AND WIRE PRODUCTS

300 MAIN STREET STAMFORD, CONN.

The Wire Outlook

The November elections have had a most heartening effect on businessmen everywhere. Since 1933 we have heard much about "mandate from the people". The 1946 mandate was unmistakably clear. Whether the Administration heeds it or fights it remains to be seen. It will be carried out regardless of the administration's attitude and America will be returned to the American people, a wish expressed at the polls by a large proportion of labor itself, among others. The result should give pause to the many labor leaders who were sailing high, wide and handsome with new plans for wage demands and strikes.

The opinion has been expressed by a number of industrialists that the Republican sweep will have the effect of securing more output per man-hour. Should this be a result either psychologically on the individual worker or because his leaders counsel it, the added productively of our mills and factories will go far toward creating better times. In spite of the many predictions of a slump in 1947, there need be no recession if labor gets down to work and produces. It would even lay a sound and justifiable basis for bigger take home pay in the future. Prices will recede in many cases when supply and demand come into better balance, but this will not upset our economy and cause unemployment if labor does its part.

People from all walks of life, of all political persuasions (except the Communists), had "had enough". The Communists, those fellow travelers in our midst who do not want to see democracy succeed, are facing ousters from labor executive posts, and from the Administration's agencies. The battles within the unions to achieve this end will be long and tough and while much has been accomplished, the housecleaning is by no means complete. Labor has other jobs to do by way of housecleaning. Our economy has been drained by union regulations limiting individual production by forcing the employment of needless workers and by subdivisions of labor crafts to so fine a point that jurisdictional strikes result. Economic law cannot be defied if labor hopes for steady employment and higher standards of living.

The nail dearth continues to add to home construction costs. A recent check-up showed that home building sizes, three to sixteen penny nails, were being produced at only 70% of capacity. Current production of nails, all types, has been only 65,000 tons a month against a need for 80,000. The scrapping of price controls should go a long way towards relieving this disparity, as indeed it will on all products. Black marketing and hoarding for higher prices has contributed to the housing difficulties.

The lifting of price controls on wire will boost production on many low profit or profitless items. This will be especially true with a number of low carbon items on which production has been small. Rod producers have been short of raw materials for steel, which has not helped better the position of non-integrated wire drawers. Pressure on wire mills is still increasing and back-logs extend into the second quarter. Absenteeism and down time prevented the upturn in production usually occurring in the Fall. Wire rope demand has been lighter than for most wire products, but the impetus of the election with its train of results to follow, should add to the problems of patented wire producers and rope fabricators before long. Bolt and nut makers are finding that the calls upon them are as great as in the war years. A widely diversified demand has greatly emphasized requirements for bolts ranging in size from 1/4" to 1/2" in diameter. Export demands are heavy, but are being deferred in favor of domestic needs.

Canada's steel industry strikes were settled in October, but it is not expected that their full steel production will be reached before the end of this month.

The coming year can be faced with hope and renewed courage. The rank and file have not failed our great Democracy in its time of dire need. So let's get on with our jobs with an assured faith in the future of free enterprise.

—from the Editor's Desk

UPRIGHT ★ ★ ★

★ ★ ★ CONE

Wire Drawing Machines

FOUNDED WATERBURY FARREL 1851

THESE high speed machines are available in several sizes and can be had with either a coiling block or spooler. The spooler may be an attachment or a separate floor-type device, such as shown. This os the No. 4 machine with belt-type cradle spooler. It is driven by a direct-coupled motor (not shown), has 13 dies and capacity for drawing copper from ¼" maximum starting size down to a finishing size of from No. 10 to No. 18 B. & S. gage. The dies and the hardened steel drawing rolls are enclosed by a rolling steel curtain to confine the splash of the drawing lubricant.

WATERBURY-FARREL
FOUNDRY & MACHINE COMPANY
Waterbury, Connecticut, U. S. A.
SALES OFFICES CHICAGO CLEVELAND NEWARK, N. J.

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

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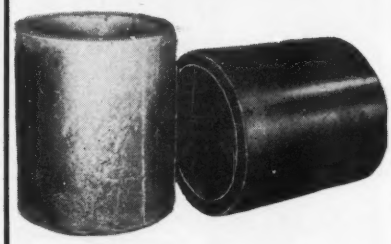

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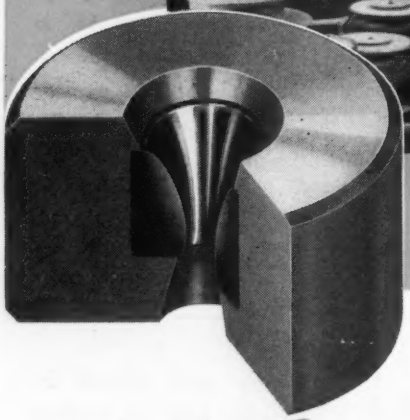

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A monthly publication devoted to the production of Wire, Rod and Strip.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 21 DECEMBER, 1946 No. 12

Mill Practice—The Care and Maintenance of Dies

by R. R. Preston, Engineer
The Carboloy Company, Inc.
Pittsburgh, Pa.

A discussion of methods to increase die life and improve production. A paper presented before the Wire Association at Buffalo, N. Y., in October 1946. ★ ★

THE Wire industry played a very vital part in winning the war. Without the tremendous production of your plants, this could not have been possible. You drew more .013 for communication lines than was ever drawn in the history of your industry; more low carbon and high carbon for welding rods than this industry had ever used; more stainless steel for welding rods than had been drawn since the development of stainless steel; a very large tonnage of rope wire and many other grades of wire very important to the war effort such as wire for torpedo nets. I could go on all through the list but the war is over and you are now faced with greater problems. Returned men from the armed forces have replaced the women in your plants. You have a large majority of your experienced men back with you but due to the 40 hour week, you have many new men to train. You have more orders on your books than ever before and your product is badly needed. Even the common nail is being rationed.

★ ★ ★

MANY plants that drew only low carbon common products wire are now going into drawing high carbon, fine wire, shape wire, and some stainless steel, and planning to draw at higher speeds and in some cases special finishes — all this you hope at a profit.

★ ★ ★

TO arrive at these, the most important things to operate a wire mill efficiently are:

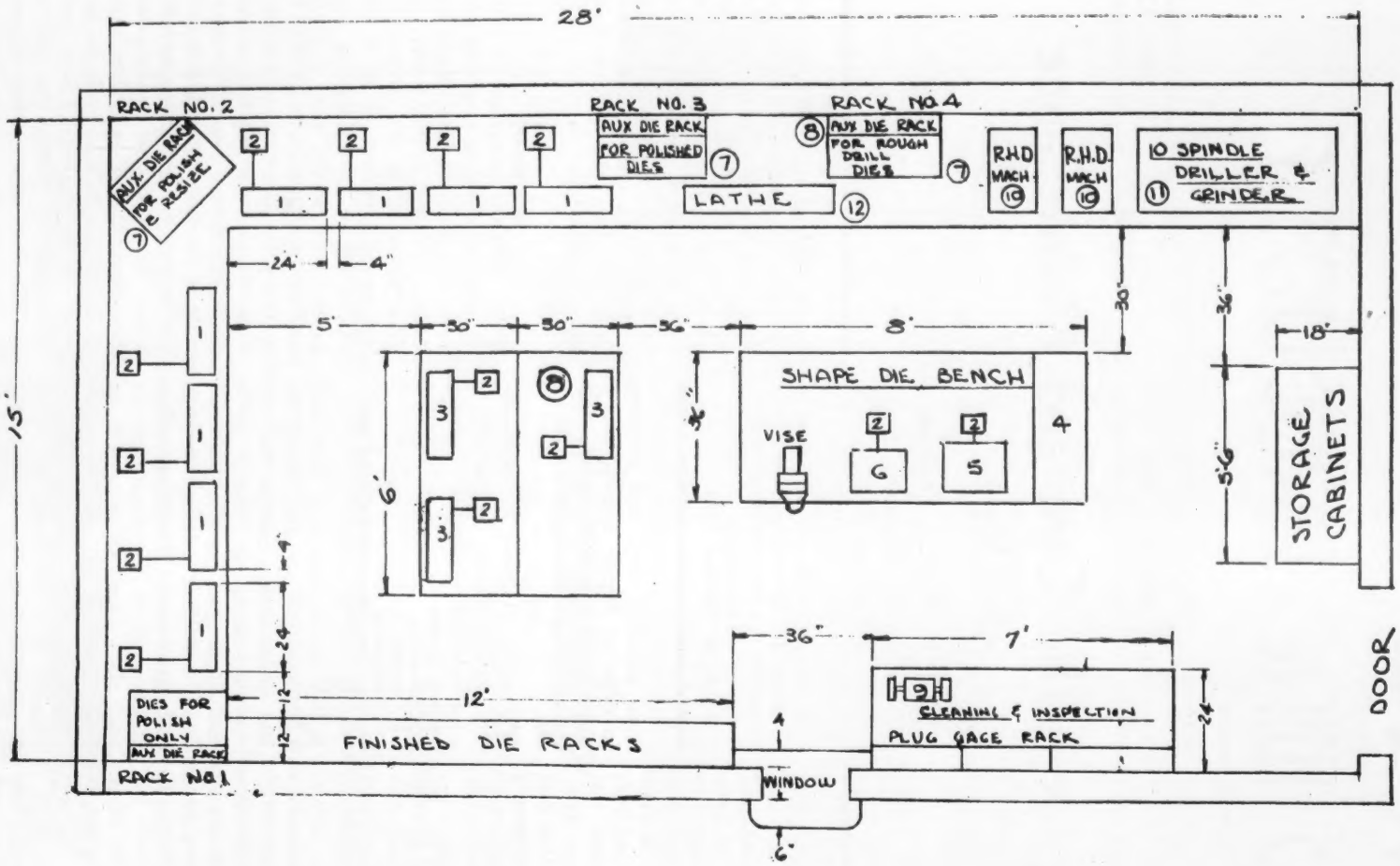
1. **Mill Layout**
2. **Scheduling**
3. **Cleaning**
4. **Lubrication**
5. **Die Room Layout and Care of Dies**

★ ★ ★

NOW let us start with Wire Mill Layout. Your mill should be laid out in such a manner that the material flows as nearly on a straight line as possible from the Rod and Wire storage through each operation to the Shipping Department or to the department in your plant where the wire is to be used. Handling and trucking is expensive; avoid as much handling as possible. You will make less scrap if you allow plenty of room for working space in your wire mill — wide aisles, with ample room for prepared stock for drawing at the ripping end of the benches — also sufficient room at the finishing end for trucks or skids. Remember for an efficient operating mill, it must not be crowded. With a layout of each department with plenty of room you will make less scrap, eliminate the chances of mixed stock and you will have a safer plant to work in.

Scheduling

THE efficient operation of your plant depends on how well you have it scheduled. The scheduling of your Rod Mill is very important. Your patenting is also important. But most important of all is the scheduling of your Cleaning Department, for on this alone depends how efficiently you will be able to operate your wire drawing benches. Your die room should be notified as far in advance as possible as to what is coming through. This will enable them to meet their schedules better. Where possible I recommend the scheduling of each bench or group of benches a week in advance. In many plants, I have seen it necessary to change dies due to the fact that someone had slipped up along the line. Stock was not ready, and this made it necessary for the wire drawer to change



NO.	QUANT.	DESCRIPTION
1	8	ROOS SEMI-AUTO POLISHER
2	13	¼ H. P. MOTORS
3	3	ROOS SEMI-AUTO POLISHER LESS AUTO TAILSTOCK
4	1	SHAPER
5	1	SHAPE DIE SHAPING MACH.
6	1	SHAPE DIE SIZING MACH.

NO.	QUANT.	DESCRIPTION
7	4	AUXILIARY DIE RACKS
8	2	FLEXIBLE SHAFTS
9	1	BURNISHER & GRINDER
10	2	ROOS HEAVY DUTY LAPPING MACH.
11	1	10 SPINDLE DRILLING MACHINE AND PIN GRINDER
12	1	PRECISION BENCH LATHE

GENERAL ARRANGEMENT OF DIE ROOM FOR EFFICIENT OPERATION

sizes, and with one man operating three or more six-block benches he had to change at least eighteen dies. Improvement in most plants can be made by giving sufficient thought to proper planning, and through getting 100% co-operation of the various departments. Remember — unnecessary die changes are costly.

Cleaning

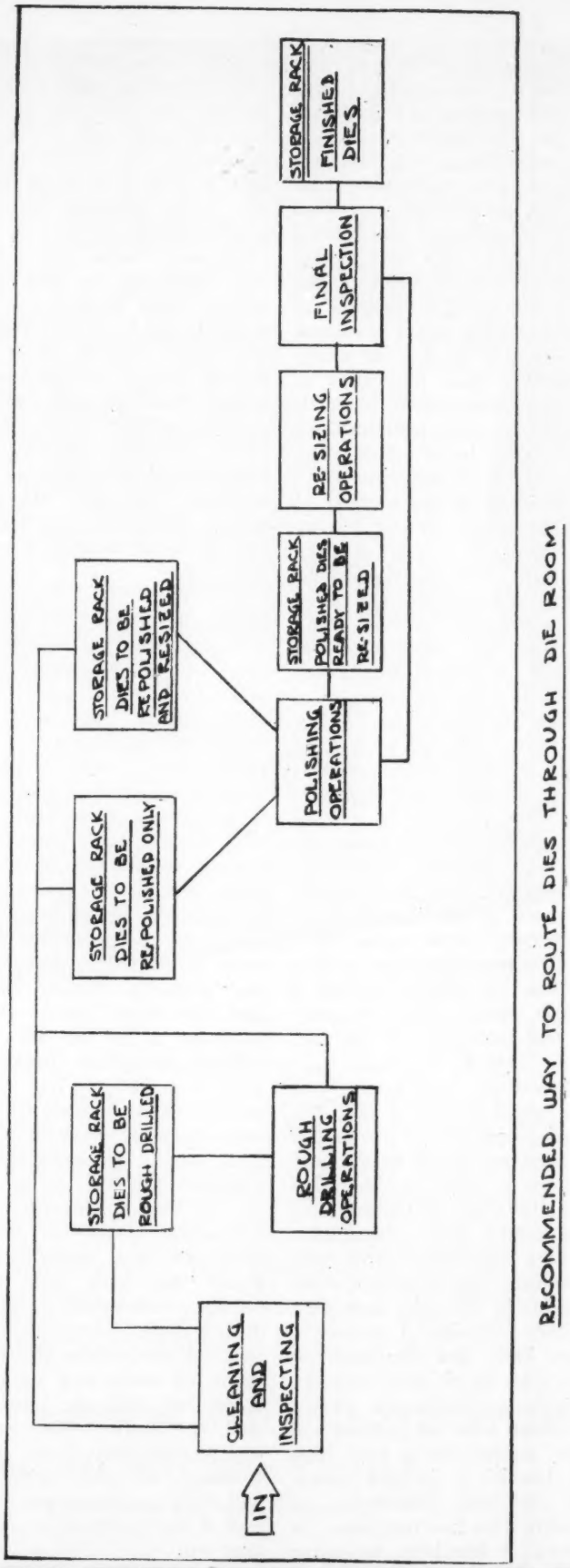
THE first step to arrive at the speeds and efficiency you hope to obtain is do a better and more uniform job of cleaning. That is, the scale must all be removed. You Wire Mill Men that are using rods from your own Rod Mill usually have a fairly uniform scale condition but you men that purchase rods from various mills have a varied scale condition to contend with. In whichever class you happen to be, you must set up a time cycle and practice that will remove all scale. The mills that have been drawing nothing but common low carbon products but now are branching out into drawing Patented Wire into the finer sizes will find new problems. They will find it necessary to spread the wire out on the yokes before immersing it in the acid bath; this is necessary because the wire coming from the Patenting furnace is so tightly packed that it is very important to be sure the scale is removed from every inch of the patented wire. This also applies to the cleaning of stock for shape wire — especially the shapes with sharp corners, as the scale must be removed or will cause short die life or scratched wire.

* * *

TIME does not permit covering every type of cleaning of all the different grades of wire, but I am sure in many of your plants if more care was given to your **cleaning**, you would have fewer die changes. Remember, you are all hoping to get more production; that means **higher speeds** and the first step to attain this desire is **better cleaning.**

* * *

NOW, assuming you have properly cleaned your stock, be sure it is well rinsed with clean


IN
CLEANING AND INSPECTING
STORAGE RACK DIES TO BE ROUGH DRILLED
ROUGH DRILLING OPERATIONS
STORAGE RACK DIES TO BE RE-POLISHED ONLY
STORAGE RACK DIES TO BE RE-POLISHED AND RE-SIZED
POLISHING OPERATIONS
STORAGE RACK POLISHED DIES READY TO BE RE-SIZED
RE-SIZING OPERATIONS
FINAL INSPECTION
STORAGE RACK FINISHED DIES
RECOMMENDED WAY TO ROUTE DIES THROUGH DIE ROOM

GENERAL ARRANGEMENT OF DIE ROOM FOR EFFICIENT OPERATION

6 | 1 | SHAPE DIE SIZING MACH. | 12 | 1 | PRECISION BENCH LATHE

water, free of acid. The next important point is the Liming operation. Proper handling of this operation is just as important as the acid in your cleaning tubs because this plays such a vital part in the tonnage you get through your dies. Lime has a threefold function: it neutralizes any acid left on the stock; prevents rust; and is the lubricant carrier. The amount of lime applied to the stock, of course, depends on the number of drafts to be drawn. Two lime tubs in your Cleaning Department is usually enough — one with medium lime, and one with heavy lime. The proper number of dips given, of course, depends on the number of drafts to be drawn. Proper Liming is very important to your die life on any stock drawn, but particularly is this true on high carbon as you have a much harder wire going through your dies, which increases the tensile strength with each draft; also the speed increases on each draft. Therefore your liming practice must be properly set and supervised in such a manner that there are no slip ups. For, remember — one or two trucks of poorly cleaned stock will cause unnecessary die changes. There is often a tendency to draw poorly cleaned and poorly limed stock, and often rusty stock, rather than reclean. It is true that your present carbide dies will take a lot, but if your stock hasn't been properly cleaned and limed, it cuts die life.

* * *

LIME substitutes have been developed which do a very good job if handled properly. Due to the end use of some grades of wire, lime-drawn wire is objectionable. This is especially true of Chain Wire which is welded. Some plants have used a lime substitute drawn wire for some time; this wire has fewer paster welds in the links than wire drawn from rods dipped in even a light lime bath. But remember — the rods must be cleaned properly. To furnish a satisfaitory drawn wire on some sizes of high carbon fine wire (which has a very high finished tensile) it is now necessary to use lime substitutes, as lime drawn wire has not been too satisfactory. It has been necessary to make some changes in the cleaning practice to give a satisfactory die life. This particular wire, when cleaned in the coil in the cleaning department in the usual way, was only giving about eight hours die life on the finishing die. But some plants have now put in cleaning tubs, water wash, and a tub with lime substitute in their patenting set-up; that is, wire is cleaned, washed, and coated with lime substitute before going on to the patenting furnace take up frame. This method has increased die life from eight hours to 72 hours on the finishing dies. The point I want to bring out is this — **if you want to increase your die life with the higher speeds you all hope to arrive at, better cleaning is necessary.**

* * *

Now comes Lubrication

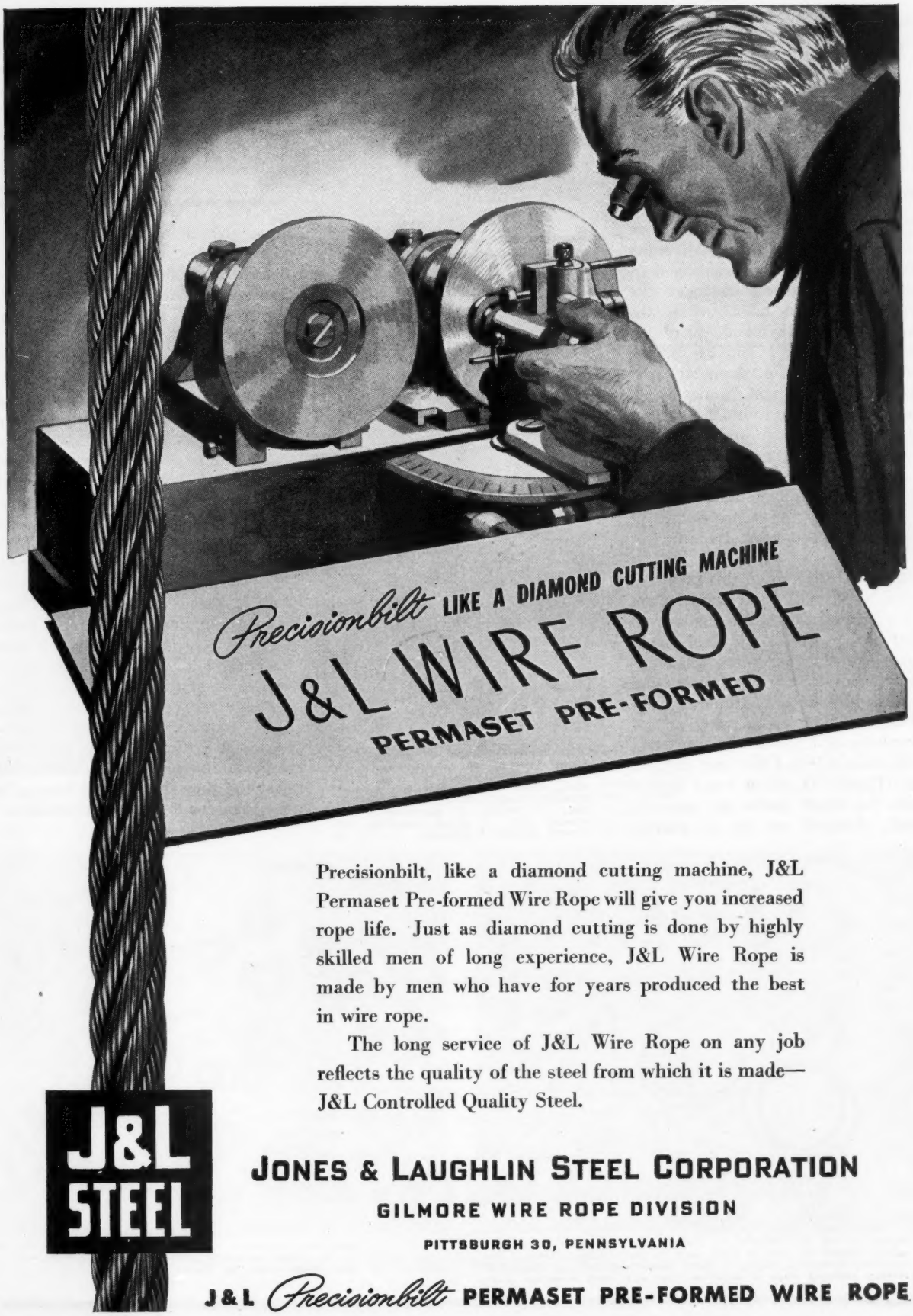
THE use of soap powder and various greases has been made ever since wire drawing was first developed. Previous to the development of tungsten carbide dies, these lubricants were in the hands of trained wire drawers with many years of experience. These experienced men are now being replaced very rapidly, for a number of different reasons. These old timers knew how to work their lubricants to give the finish that was required on the particular wire they were drawing. They knew the stock was properly cleaned and limed. And they knew how to work their lubricant to get the stock to draw without scratching. Today most of your men haven't had this background. In most cases, they haven't been properly instructed in the right way to use lubrication to get maximum life and best performance out of dies. I am sure if more instruction could be given your new men by a competent man it would not only help the wire drawer, but would help increase die life and improve your production. I'd like to also point out that there are some new wire drawing compounds that are working very well on Spring Wire and other high carbon wire. I am sure more training of your wire drawers will show an improvement in your mill if this program is put on and kept up.

NOW comes the final and most important part of your wire mill. It is the Die Room. It doesn't matter if you are operating one of the large tonnage mill with a capacity for drawing one thousand tons a day, or a small specialty mill drawing only a few hundred pounds per day — the Die Room is the "heart" of your mill. No part of your plant that takes up so small a space can compare to this room in importance. The men you have in this room must be trained and supervised by a man with a thorough knowledge of all operations. He must not only be completely informed on all phases of die room practice, but he should have a sound general knowledge of wire drawing methods. He should have at hand, as far in advance as possible, a schedule of what is to be drawn. The die racks must be kept well stocked with the standard sizes of dies you are using. In order to keep your die racks well stocked and your dies in good condition, prompt servicing of your dies at first sign of wear will give maximum die life and reduce servicing time. Early servicing is vital due to the characteristics of cemented carbide. This material is composed of thousands of minute particles cemented together. When these become undermined by excessive wear, pressure increases at the point of plastic flow and "wear" occurs at a progressively accelerated rate until a ring is formed. This becomes wider, deeper and rougher until finally the coating is removed from the wire, causing the wire to scratch and rapidly wear the die. To reclaim a die in this condition, usually requires recutting to larger size with resultant loss of otherwise usable die life.

* * *

THIS excessive wear may be avoided by careful inspection of each die when it is returned to the die room. If evidence of even slight wear is apparent, the die should be touched up, by repolishing, before being returned to service. By this procedure, the life of the die is increased many times since reservicing under such con-

(*Please turn to page* 996)



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Atmosphere Heat Treating Alloy Steel Wire Springs and Small Parts

by H. M. Heyn
Surface Combustion Corp.,
Toledo, Ohio

FOR variations in size at least, and probably also in diversity of shapes, few heat-treating furnaces are required to meet the types of work handled at the **Barnes-Gibson-Raymond** plant in Detroit (Figures 1 and 2). Spring washers ¼ in. in diameter produced from 0.010 and thinner stock, engine valve and other springs produced from wire and numerous complex shapes from strip and sheet stock, all are required to be treated in the same equipment, three furnaces handling the entire output of this plant under normal conditions.

* * *

PRODUCTION from this plant includes small parts such as the springs mentioned above, made from both carbon and alloy steel stock. Atmosphere furnaces are used entirely. Those of **Surface Combustion** manufacture are of continuous pusher radiant-tube type, using an atmosphere of Char-Mo gas enriched with from 3.5 to 4 per cent natural gas (Figure 3). Alloy trays loaded with the small parts are automatically dumped into an oil quench upon completion of heating cycle in the furnaces (Figure 4). Literally hundreds of thousands of such parts are handled daily, in batches up to a thousand or more depending upon size.

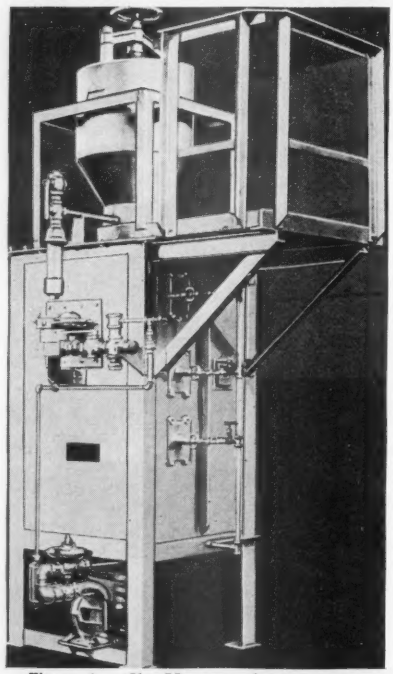
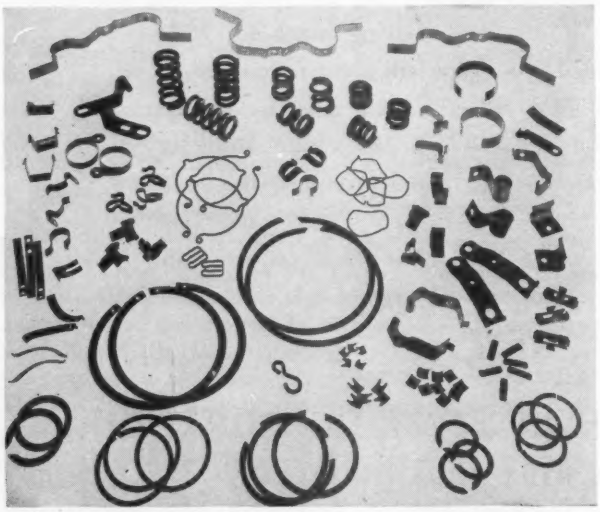


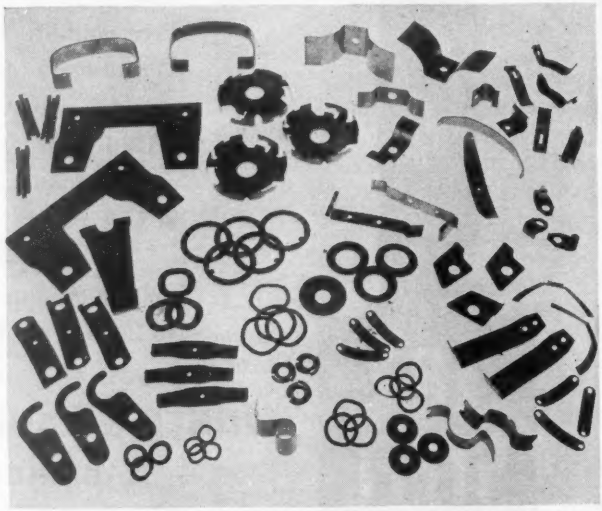
Figure 3 — Char-Mo atmosphere generator of type used to supply the basic atmosphere, which, after enrichment, supplies a suitable clean hardening atmosphere. The basic gas consists of approximately 2/3 nitrogen and 1/3 carbon monoxide, with a small amount of hydrogen. * * *

* * *

SINCE pieces of the materials and sizes produced are very critical as to either carburization or de-carburization, as well as oxidation, the constituents of the atmosphere must be precisely proportioned at all times. Atmosphere control must therefore be quite precise. In providing the necessary accurate control **Mr. F. P. Zimmerli, Chief Engineer** and **Mr. G. D. Wilson, Chief Metallurgist,** have contributed developments in equipment which aid materially in securing desired results (Figure 5). These include pyrometric regulation based upon the temperature of the furnace charge as distinguished from the temperature of the furnace gases, a point of importance when it is considered that the time the charges remain in the furnaces is but a few minutes.

* * *





Figures 1 and 2 — Possibly no furnaces are required to handle as wide a variety of parts as those used by Barnes-Gibson-Raymond for hardening operations. Figure 1 shows samples of coil and small leaf springs, retaining rings of different types and small stampings made largely from round and rectangular wire which are heat treated in the same furnace as the larger stampings, washers and flat springs produced from steel strip shown in Figure 2. * * *

IN general the variations in sizes of parts made from the same material are taken care of by varying the speed of the furnace cycle. This may be regulated so that the heating time may range from about 45 seconds up to approximately 3 minutes, a 2.5 minute heating time being typical. At this rate the furnace charge is about 600 lb. per hr., but may be as low as 100 lb. if the parts are especially bulky. Obviously poundage is not a factor in work of this kind, the essential condition being that of obtaining desired metallurgical characteristics for the material.

* * *

WHEN changes of material occur, temperature adjustments are obviously necessary, the alloy steel usually requiring about 100° Fahr. higher temperature than for carbon steels, as well as occasional changes in the constituents of the atmosphere. Here again accurate control and means of determining the gas composition are essential to prevent later rejection of pieces produced for not meeting physical or chemical specifications (Figure 6).

* * *

FOR the small spring washer for instance a steel containing 0.70 to 0.80 C, 0.50 to 0.80 Mn, is typical. These are heated to 1425-1450° Fahr, quenched in oil and drawn to 775-825° Fahr. For an alloy steel valve spring a chromium vanadium material such as SAE 6150 may be used. Springs of this material are heated to 1575-1600° Fahr, quenched in oil and drawn to 840-900° Fahr. A high capacity oil pump circulates the oil in the quench tank as an additional assurance of a rapid quenching rate.

* * *

IN special cases the material may be martempered. Hot salt is used for quenching to eliminate hardening cracking. In a few instances SAE 1095 may be used, but this material is seldom favored since a somewhat lower carbon and higher manganese content are considered more desirable for springs of this type.

NOTE on figure 6

(Due to color of ink used on chart and light reflection on recorder cover glass, photo has been slightly retouched to clearly indicate temperature line. No change from original, however. Editor).

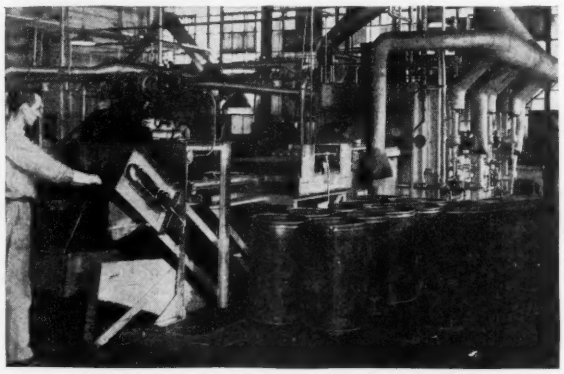


Figure 4 — Discharge end of one of two Surface Combustion Clean Hardening Radiant Tube Furnaces in B-G-R Detroit plant.

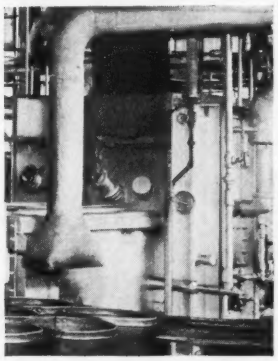


Figure 5 — Close-up of same furnace to show location and angle of pyrometer tube in end of furnace. * * *

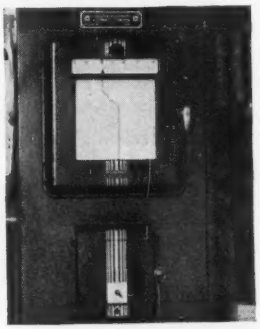


Figure 6 — Face of recording pyrometer showing virtually unchanging hardening and holding temperatures mantained during furnace operation. * *

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SHELL INDUSTRIAL LUBRICANTS SHELL

Some Observations on German Cable Manufacture

by R. A. Schatzel
Vice President and Director of Engineering
Rome Cable Corp.,
Rome, N. Y.

AS we entered the ruins of Cologne in late May and early June of 1945, there still were posted quotations from Hitler's "Mein Kampf" on partly demolished buildings. There were many posters urging greater effort, warning against revealing information and huge drawings of a furtive figure in Black — the Werewolves, but this quotation was the most bizarre of all, for translated it read: **"Give me five years and you will not recognize Germany"**. The thousands living in the cellars of these ruins or crowding the reads to nowhere knew only too well how true that statement was.

* * *

THE guns were silent and so was all industry and commerce. No one was allowed to work, and the principal occupation of the populace was to find shelter and food; all private vehicles had been confiscated and put in charge of the Military to move displaced persons or released allied prisoners of war. It was necessary for civilians to obtain a permit to ride a bicycle, and to show a pass when leaving a very restricted area. We may say the principal occupation was standing in queues to obtain food, permits, and to show a pass at every bridge and zone boundary in the city.

* * *

I shall not attempt to be complete, as information on details of individual plants and materials are published in detail by the Department of Commerce reports. Our Reports on Synthetic Rubber and Plastics have also been summarized and reported in 'India Rubber World', and 'Rubber Age'.

The author was chairman of W.P.B. Technical Consulting Committee for Wires and Cables. A member of U.S. Government Technical Intelligence Industrial Committee to inspect German plants and this paper covers his observations resulting from his recent inspection of German Cable Mills. * *

IT may be of value, however, to piece together a few highlights gleaned from trips through cable plants at Hanover, Cologne, Leverkusen, Mannheim, Rheydt and Nuremberg, with the assistance of our British associates who were most cooperative and helpful.

* * *

WE will take a short trip through a composite mythical German cable plant putting humpty-dumpty back again as best we can, and remembering that not a wheel is turning or has been for a month or more.

The Plant

AS we enter the plant we note that it is completely fenced in by brick walls with permanent guard houses built in. Other adjacent areas are enclosed in high barb wire fence and this contains numerous tar paper shacks in which live the imported (slave) labor. It does not take much investigation to know that these are filthy, but we are assured that this is only because the Russians are dirty anyway, and since the end of the war have been out of all control. The yard is neat and in it are entrances to an underground reinforced concrete refuge from air raids. These are connected by tunnel to some sections of the plant. Other shelters are provided in the plant.

IN one respect the yard of this plant looks quite like the yards of many of our American plants, for there is very little copper there. However, there are some 225 lb. bars of American refiners piled neatly, and also a stock of End Cast billets 6.5″ square x 7 ft. long, weighing approximately 800 lbs., cropped at one end, and pointed at the other. These are used to roll Trolley wire and avoid silver soldered joints as much as possible. We also find a large pile of scrap copper cable returned from salvaged boats, bombed out factories, etc. Clean copper scrap in any form is liable to be found in this pile, for this plant, like many large German Cable plants, has its own small Smelting and Refinery, and collects the scrap from a given area. This practice was followed prior to the war and the Government made good use of it during the war. There is also a much larger pile of Aluminum billets pointed at one end, 4″ x 4″ x 48″. These are received from a supplier in what was formerly Czechoslovakia or from Southern Germany. Aluminum is used on all cables where wire larger than No. 20 Awg. is involved and copper is used only for certain very restricted applications. The yards are invariably neat and well kept.

The Rod Mill

WHEN we step into the rolling mill we notice little difference in general arrangement from our American mills. However, we note that many more men are employed. We are surprised to find that the same mill rolls both copper and aluminum.

* * *

THERE are two billet furnaces — one gas fired and the other coal fired. Only the gas fired unit is used for aluminum and we are told that the same furnace is also used for copper, care being taken to use separate skids in the furnace for aluminum and copper. The temperature for aluminum is 310°C. and for copper 800°C. Some smaller mills roll only copper but the largest, Leonische at Schwabach (which we did not visit) also rolls zinc.

* * *

8 mm (5/16″) rod is quite standard — 19 passes are used, and production of 15 metric tons per hour is averaged. Repeaters are used on the roughing mill but not on the fine mill. However, we are told that other mills extend the use of repeaters further, and some do not have any repeaters. The production of aluminum is stated to be the same as copper — about 140 bars per hour. We are somewhat puzzled by the roughing mill, since it has 12 passes, but when we recall the 800 lb. billets in the yard the use of additional passes is explained. Our mill uses a combination of Roller, Bronze and treated wood bearings. We are told that wood is used to a considerable extent, as well as Bakelite.

* * *

HOW does a Rod Mill stand up under bombing? The vulnerable parts of the mill are the furnace and motor drive. If these are not destroyed the only way to knock out a rod mill is by a direct hit on the rolls. The degree to which it is incapacitated is determined by how far it has been mechanized. Mills without repeaters are best and labor is cheap. We have seen a mill with no roof, with floor plates temporarily replaced and with the sides of the building blown out, by a bomb hit directly on the roof and back of the rolls. The plant was out of production but a few days. Copper rod is stored black and shipped or sent to the Bare Wire Department for pickling as required.

Trolley Wire

WE notice also, that this same mill is making Copper Clad

Typical of Transportation Bridge Across Rhine at Cologne

* * *

Figure 9 Trolley Wire. A copper tube is shrunk on a 2″ round steel billet about 18 ft. long and after rolling is drawn to the shape desired.

* * *

IN Europe the trolley system is still the predominant method of urban transportation, and substitutes were needed — therefore a combination aluminum-steel figure 8 section was made by drawing the two lobes separately and inter-

Factory

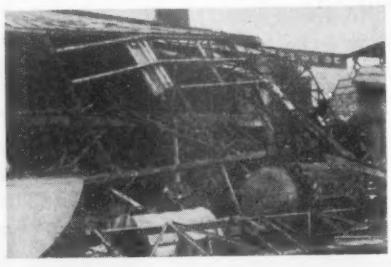
* * *

locking them like a tongue and groove in a final drawing operation. The one lobe of steel supported the conducting lobe of aluminum.

The Wire Drawing Department

THE Wire Drawing Department of this plant is divided into three sections generally:

	5/16 — 0.48	(17 aag)
Heavy wire	8.0 — 1.2	MM
Medium "	1.2 — .6	MM (22)
Fine "	.06 — .05	(44)



Vulcanizing Room

* * *

In some cases fine wire to .02 (.0008″).

* * *

BOTH Copper and Aluminum rods and wire are electrically welded, similar to American practice. The machines made by **Strecker** (Dusseldorf) are in general use. We note that for paper cable, some large solid specially shaped aluminum conductors are used.

* * *

MOST of the wire drawing machines in use are made by **Kratos.** These are large step cone machines which is the basic design of large, medium and fine machines. Alloy steel dies of **"Elmarid"** or **"Widia"** type are used — the operations are conventional. However, we note three machines which are somewhat different from the others. A large machine made by Leonische is a 21 die machine generally used to draw from 8.0 (5/16″) to 1.2MM (Approx. No. 17 Awg.). It could be used for large sizes for overhead lines since each of the first five dies were in line and followed by a block, thus enabling larger sizes to be drawn without running the whole machine. Another large machine for drawing from 8 MM was made by **Maschinenfabrik** of Herbon.

* * *

WHILE this machine was of the step cone type, the drawing capstans while in use, were vertical. The machine was counterbalanced so that it could be tipped thru an angle of 90 degrees and strung up readily, then the capstans were let tilted down into a dip tank. The drive was directly over the string-up capstans. Of course it is impossible for us to see this machine in operation, but from production records and statements of our German guides the machine draws to 1.3 MM (No. 15 Awg.) from 5/16″ rod at 3000 ft. per minute and maintenance cost is low. The dip in the tank is circulating slowly but is green. It is made from Olive oil, as it is explained that there has been a shortage of animal fat in the country — which has a familiar echo now.

* * *

THE third machine is a **Kratos** Fine Wire of conventional step

cone design; however, it does not seem complete. The stepped capstans at either end are not housed in and run dry. The dies are mounted in a bracket between the capstans which has a hinged cover on top. When the machine is in operation the drawing solution is pumped up over the dies in the bracket and flows back to a central system. No lubricant on the capstans except that which is carried by the wire from the die, is used. This machine draws from .12 MM to .05 MM at a speed of 16 meters per second (3000 ft. min.).

Annealing

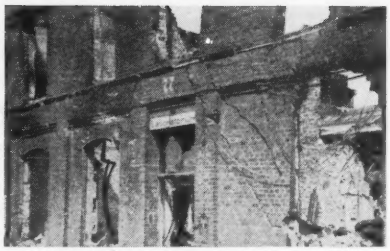
THE annealing process is not impressive. Generally electrical annealing furnaces are used. To avoid oxidation, trays of powdered charcoal were placed above the coils of wire to be annealed. A more modern unit of 9 electrically heated annealing kettles flush with the floor, takes up a large space in one corner of the room. These are the Gruenwald Process and employ the products of burning brown coal gas as an inert atmosphere. We are told that Leonische carry out annealing under a vacuum.

Tinning

TINNING — We can go hurriedly through this department as the tinning practice appears the same as in America except that the pots are electrically heated. The alloy used, 60 lead, 40 tin, but the use of such alloys was reduced all possible by the use of a thin layer of cellulose acetate tape over the bare conductor; and of course, aluminum which accounted for the major footage of wire did not require tinning.

Stranding

BEFORE leaving this section we will look at one of the stranding machines which is not of conventional type. It is a machine for making a 49 wire rope strand in one operation. It is of the "sun and planet" type and could take wire up to 0.4 MM diameter. It consisted of a rotating carriage holding six wires which formed a regular 7-wire strand about a center wire, followed by a large cage carrying six small stranding carriages which both formed the 7-wire strands and simultaneously stranded the whole of the seven strands so formed together, the first being the center for the other six. Production is claimed of 15 KM (9 mi.) of 49 wire or rope strand in an 8 hour shift. The manufacturer was **J. A. Kraft** of Olpe, near Köln.



Laboratory of Bombed Factory ★ ★ ★

Paper Cable Machines

FINE Wire drawing and small stranding machines, braiders and paper covering machines for the making of paper cable were largely destroyed by bombing or damaged by sabotage. Inflammable or delicate equipment was particularly vulnerable — nevertheless we find the department making enameled wire still operating. We are struck with the low ceiling and the fact that this enamel department is on the second floor over fine bare drawing. We note then that all the machines are Horizontal. Some machines are made by **Siemens**, Berlin, and most companies have made variations on this design. Electricity is used for heat in most large and medium machines and universally for fine wire. Gas is used to considerable extent for heavy and medium wire. Some large companies use vertical machines of their own make or use vertical machines made by **AMA-G.b.H. Spandau.** The type of enamel used is a conventional type Oleoresinous varnish. We are interested to know their experience with **Formvar** types. They do not have any serious interest but explain that they are conducting experiments with **Perlon** (Similar to Nylon) and believe it will be suitable for some special applications.

Street in Industrial Section of Hamburg

Drawing Aluminum Wire

IN running 2 MM (No. 12 Awg.) aluminum, five coats are applied. General practice is to apply from 4 to 6 coats of enamel. The enamel oven is approximately 12 feet long. A coat of enamel is applied at each end of the oven. One interesting feature is that the wire is cooled by water and wiped dry with an air wipe on each pass. After two coats of enamel are applied the wire is passed one extra turn through the oven without the application of enamel to give it an extra baking and the same treatment is given the final coat so that while five coats of enamel are applied, the wire travels through the oven seven times. The temperature of the oven is 400°C. The product has an unusual brown color — this is because of the aluminum base. The fine machines are approximately 4 ft. in length. They are small and compact. Each oven contains 4 tubes and each wire is completely enameled in a single tube. We do not observe any outstanding quality tests, and the coating shows some eccentricity. However, it appears quite satisfactory in service.

Magnet Wire

IN passing through the Magnet Wire department we note that the machines are similar to American insulating types in this country. However, cotton is not used — Cellulose Acetate is the most common. Paper, both plain and coated with Cellulose Acetate is used, and we find some glass.

★ ★ ★

AS we leave we note again a construction near the exit

(*Please turn to page* 980)

Donachie Awarded Wire Association Medal for 1945

Highlights of the Wire Association 17th Annual Convention held at the Hotel Statler, Buffalo, N. Y., October 21st-24th, 1946. ★ ★

THIS year's annual meeting of the Wire Association, Hotel Statler, Buffalo, N. Y., Oct. 21-24, was characterized by the high quality and simplicity of the technical papers presented, high registration and the attendance and interest at the various technical sessions. The registry included five representatives from England, two from China, one from Australia, one from India, one from Norway and three from the Soviet Union. Final registration was 350. Total membership of the Association now stands at 650.

★ ★ ★

THE Board of Directors of the Wire Association held its semi-annual meeting at the Hotel Statler, Buffalo, New York, Monday, October 21st, and unanimously awarded the 1945 Wire Association Medal to **MATTEW J. DONACHIE**, Technical Director of Production, Beryllium Corporation, Reading, Penn. for his paper entitled "Some Traits and Characteristics in the Working of Beryllium-Copper Wire". Honorable Mention certificate was awarded to **RALPH C. ELLAMS**, Supervisor, Electrical Coating Development, Roxalin Flexible Finishes, Inc., Elizabeth F. New Jersey for his paper entitled "The Successful Finishing of Electrically Insulated Wire and Cable".

★ ★ ★

THE 1947 annual meeting will be held the latter part of October at Chicago, Ill. **Dr. F. R. Morral**, Metal Trades Laboratory, Technical Service & Development Division, American Cyanamid Co., Stamford, Conn., has been elected chairman of the program committee for 1947.

★ ★ ★

AT the directors meeting, a vote of thanks was extended to **Richard E. Brown**, Executive Secretary, for his work during the year, also to **Mr. B. L. McCarthy**, Chief Metallurgist of Wickwire Spencer Steel Division of Colorado Fuel & Iron Corp. for his work in connection with the plant inspection of the River Road Plant of that company held on Tuesday afternoon, October 22nd.

★ ★ ★

AT both the Directors Meeting and the Annual Meeting of the Wire Association, a special vote of thanks and appreciation for the many fine services rendered by **MRS. R. S. SPENGEL**, assistant to the secretary, was unanimously voted and the Secretary was instructed to write a letter of appreciation to her in behalf of the Association.

MATHEW J. DONACHIE, CONSULTING METALLURGICAL ENGINEER, HOLYOKE, MASS.

Mr. Donachie came to the United States in 1926 — Attended the Technical College, Coatlridge, Scotland; also the Franklin Union Institute, Boston, Mass. Employed by Gilby Wire Company (now W. B. Driver Company) from 1926-1930, in the testing laboratory and development work. Metallurgical Engineer for General Alloy Company, Newark, New Jersey, from 1930-1931. In 1931 went to National Harris Alloy Company as Chief Metallurgical Engineer. In 1933 to George W. Prentiss Company, Holyoke, Mass. as Metallurgist. Also consultant to Beryllium Products Corporation, from 1935-1942. From 1942 to 1944 employed at Beryllium Corporation, Reading, Penna., as chief metallurgist and acting as technical director. Now acting as technical adviser and consultant for Beryllium Corporation. ★ ★ ★

★ ★ ★

PRECEDING the opening of the technical sessions, the officers and directors of the Association attended a luncheon to the speakers, authors, and the program committee and others participating in the program. At this luncheon the plans for the week were laid out and operated most successfully.

★ ★ ★

TUESDAY afternoon there was a plant inspection at the Wickwire Spencer Steel Division of the Colorado Fuel and Iron Corp., River Road Plant, and about 150 members of the Association attended. This was one of the outstanding events of the Convention as it is the first time in five or six years it has been possible to hold a plant inspection, and many favorable comments were heard from the operating men for the way in which the trip was handled by the officers of the Wickwire Spencer Steel Division.

★ ★ ★

THE Annual Wire Association Luncheon which was held on Wednesday for the first time was utilized for the purpose of presenting both the Medal Awards and the Mordica Memorial Lecture.

★ ★ ★

BECAUSE of the difficulty in obtaining medals during the war period, certificates were presented to authors who had been awarded the Wire Association's annual medal for the most meritorious paper on wire manufacture or fa-

brication submitted during 1942, 1943, and 1944 At the Wire Association's luncheon Wednesday afternoon, however, **R. M. Hussey**, president of the Association presented the long delayed medals to the following:

L. D. Seymour, assistant works manager, Canadian Works, Steel Co. of Canada, Ltd., Hamilton, Ont. for his paper in 1942 entitled "Scheduling and Planning the Wire Mill for War Production".

J. C. Aiken, assistant superintendent, rod and wire mills, Jones & Laughlin Steel Corp., Aliquippa, Pa., for his paper in 1943 entitled "Drawing High-Speed Rope Wire".

A. R. Zapp, manager, carbide division, Firth-Sterling Steel Co., McKeesport, Pa., for his paper in 1944 entitled "History and Growth of the Tungsten Carbide Die".

* * *

FOLLOWING the presentations, the Mordica Memorial Lecture was delivered by Mr. Fred M. Crapo, President, Indiana Steel and Wire Company, his subject being "Galvanized Steel Wire".

* * *

IN this connection our "Special Correspondent" reports "The Providence that watches over the directors when they pick out the Mordica Memorial lecturer was very much on the job this time. A man who is known as an expert in his subject and has a clear and logical mind, and a pleasant style of prose, is a natural for the Memorial, and **Fred Crapo** held even the ladies spellbound. The lecture, an interesting historical review and a temperate and restrained evaluation of the present state of the art of galvanizing wire, is of the sort that every member will re-read, and file away in an accessible place".

* * *

THIS particular luncheon marked the highlight of the meeting not only for interest but for dignity and impressiveness, and it is earnestly hoped that the standard set will be maintained in future years.

* * *

COMING to the subject of the Smoker-dinner our "Special Correspondent" reports that "he got out his list of adjectives and set out to do justice to **Gus Zapp's** vaudeville, but found to his dismay that the adjectives had been used so many times on the same subject that they were worn out. He will have to content himself with the observation that it was in the best Zapp tradition. Few of those present will ever forget Prof. Backward, or Miss America of 1943, or Amos and Andy.

"Still fewer will forget an unscheduled bout between Man Mountain Zapp and an anonymous Equine Fraction who insisted on gumming up the wheels of progress. 'O what a fall was there, my countrymen!' (Julius Caesar, III-2), this line is tossed in merely to show **John Callaghan** that **Shakespeare** can be quoted just as nonchalantly on our side of the international boundary as on his.

* * *

"THE first fall, which was also the last, was credited to Man Mountain in two fifths of a second, on a flying mare. O that men should put an enemy into their mouths that steals away their brain! (Volstead, Act I)."

* * *

A description of the technical proceedings as prepared by our "Special Correspondent" follows:

Highlights of the Technical Sessions by Our Special Correspondent

THE sessions got off to a good start, in spite of the absence, due to illness in the family, of chairman **Moritz**, who was to have taken the first meeting. **John Callaghan** filled the breach with his customary urbanity, though a captious critic might have questioned the propriety of quoting from the works of a non-union dramatist at a meeting devoted to a discussion of labor relations.

Present Day Labor Problems

DISCUSSION of **Mr. Sanderson's** able presentation of the labor picture revolved around seniority rights and the differences between seniority and length of service. But with due deference to several able and experienced commentators, it was **Herb Clark** who illuminated the subject, with the description of his "wailing wall". This is his name for a tri-weekly session of executives and other personel on several levels, who carry on as the name would imply, at which five seats are always reserved for union men nominated from the shop.

* * *

THE **Special Correspondent**, as is well known, is one of those old crabs who see no good whatever in unions, and no future for the economy that tolerates them. He does not rail at the greed and arrogance of the leaders, nor the idiocy of the rank and file; his contention is that the whole idea is wrong in principle, harmful alike to master, man, and country. He expects the whole lunacy to be whirled away in the tornado of the next depression, (which he is confident will be a lulu.) Nevertheless, we must live with them for a while, and moreover, whatever the relations of labor and management in the brave new world of the future, to coin a phrase, the better they know each other's problems, the easier will be their intercourse. "Comprendre tout, c'est perdonner tout" says the philosopher.

* * *

MANAGEMENT, as a rule, sees the whole picture, having for the most part come up through the ranks. Labor must be brought to appreciate the managerial headaches in the corporations as labor sees and appreciates the headaches of the little one-man establishments. The **Special Correspondent** vividly recalls numerous occasions when he stood on the open-hearth floor, his naked torso dripping sweat and criss-crossed with burns, his horny hands on his hips, and felt acute nausea at the sight of a troop of salesmen and minor executives, arrayed like lilies of the field, conducting a slumming party of customers. He used to wonder, in a dumb fury, how many of these panty-waisted parasites he was supporting, and why.

YOUR **Special Correspondent** had a college degree and a modicum of intelligence, and if he could harbor such thoughts, what must be the poisonous thoughts surging about in the brain of the average manual worker? The S. C. could faintly discern the function of cost men, and other accountants; just faintly. But as for salesmen, if he ever gave the subject a thought it was to assume vaguely that if the world were only apprised of the fact that our superb steel was generally available, it would be snatched up almost automatically.

* * *

SOME way must be worked out to enable, yes, to force the rank and file to spend some time where they can see the managerial problems flying about, and being dealt with. They must come to see that management entails some attributes other than a loud voice and a mean disposition. Herb, we thank you. You have always been in front; now we see you way up ahead on the path that we must all follow.

The Effect of Water Impurities in Electro-Plating

DR. **MORRAL's** paper on demineralizing water was a novelty to most members. In view of the fact that water enters into nearly every mill operation it seems odd that so few of us have stopped to realize that we have been dealing with an aqueous solution of salts and are usually ignorant even of what minerals are involved. The S. C. now recalls that Lipton's tea is made up in some two hundred blends under the same name, merely to insure that in solution in the same number of distinct kinds of water currently used in England, the brew may have the corrosive properties that the British belly craves. We know that a wet-wire expert may shift from one part of the country to another and find his formulas absolutely useless.

* * *

DEMINERALIZED water containing as low a percentage of solids content as distilled water, can be made available as readily and nearly as cheaply as ordinary tap water without distillation. Certain synthetic resins having remarkable ion-exchange characteristics are employed in the process of demineralization. One of these resins is a cation-active material and another is an anion-active material. The speaker explained that water containing sodium chloride is filtered through a bed of hydrogen-activated cation resin. The resin takes sodium to form sodium resin and gives up its hydrogen which would be chloride forms dissociated hydrogen chloride. Water containing the latter then flows through an anion resin bed where the hydrogen chloride is absorbed by the resin leaving water partly or entirely free of sodium chloride.

* * *

UPON exhaustion, the ion-exchange resins are easily reactivated by passing a dilute acid solution through the bed of cation resin and a weak alkali through the anion bed. The speaker pointed out that ultimate replacement with the new resins is due only at long intervals. Some units have been in steady operation without renewal for many years.

* * *

THE filtering operation which **Dr. Morral** describes is infinitely cheaper than distillation, and can be measurably close to it in effect. It is admitted that the synthetic resins of the filter can not separate out the organic impurities, except of course the big pieces, and certain crystalline matters. Dr. Morral told us, for instance, that the process can take most of the residual sugar out of molasses. Doubtless that is why molasses, these late years, tastes like something squeezed out of a grasshopper.

* * *

WE wonder what will be the value of this process in those sections where it is virtually impossible to get a sull coat. The questions from the floor about the cost of filter cleansing agents, time out of service, and the like, indicate that the paper has started something.

Manufacture of Steel for Basic Rope Wire

R. **D. Hindson**, Steel Company of Canada, Ltd., Hamilton, Ont., Canada, in speaking of "Manufacture of Steel for Basic Rope Wire" pointed out that about 10 per cent of the total furnace charge for 20,000 lbs of limestone is used. After the limestone is charged about 100,000 lbs of scrap or 50 per cent of the metallic charge is added to the furnace. After about three hours hot metal equivalent to 50 per cent of the metallic charge or about 100,000 lbs is put into the furnace. Scrap continues to melt and slag forms at the surface of the bath, the slag representing the first stage in the purification of the charge.

* * *

SCRAP usually is completely melted about 45 min after the hot metal is charged and then the lime boil starts. The speaker explained that this boiling action thoroughly mixes the bath and brings the lime in close contact with the impurities as it rises to the surface to form the main constituent of the slag.

* * *

TWO hours after the hot metal is charged, the lime boil subsides and the working period starts. This is perhaps the most important stage in the melting of a rope wire heat, because during this period the melter must shape up the slag so as to produce satisfactory quality steel. Iron oxide in the slag is controlled by varying the viscosity and basicity of the slag.

* * *

AFTER impurities in the charge have been oxidized and removed the steel is deoxidized by using a certain amount of 79 per cent ferromanganese. In order to remove all the iron oxide present in the bath 100 lbs of aluminum is added about 8 min after the ferromanganese addition.

* * *

MR. **HINDSON** mentioned that the heat is tapped into the ladle, ferrosilicon is added to bring the silicon content up to specification and about 3 lbs per ton of calcium manganese silicon is added to the ladle to further clean and degasify the metal. Approximately 9 to 10 hrs is required to make a heat from the time material is

charged until steel is tapped from the furnace.

* * *

STEEL is held in the ladle until the temperature drops to about 2760°F. and is then poured through a 1¾ in. nozzle into 22 by 24 in. big-end-up molds equipped with metal hot-tops. The ingots average about 8400 lbs. The interior surface of the molds is coated with tar in order to minimize slivers and seams in the steel.

* * *

MR. HINDSON's admirably comprehensive paper on the manufacture of steel for basic rope wire was a factual summary too complete to provoke much discussion, although there was a certain amount of kidding back and forth, most of which must have flown right past the recorder, between rod suppliers and rod buyers on the subject of plus and minus tolerances, the latter accusing the rod men of accentuating the positive, eliminating the negative, and practically never messing with Mr. In-between. All good natured, no bloodshed.

* * *

Some Unusual Conditions Encountered in Cold Heading Products

FORMING of threads by rolling steel of circular section to about pitch diameter size between hardened dies has proven to be the most economical means of threading the majority of steel bolts. This fact was brought out by **F. W. Nobbs**, Chief Inspector, Steel Company of Canada Ltd., Toronto, Ont., Canada, in speaking on "Some Unusual Conditions Encountered in Cold Heading Products". The speaker attributed the economy to the high speed of processing, the saving of material, and the long life of dies. Roll threads, he stated, have higher ultimate strengths and fatigue resistance than cut threads. Threads rolled after heat treatment have a higher fatigue resistance than those rolled before heat treatment.

* * *

THE author found that roll threading after process annealing gave higher ultimate strength values than roll threading prior to such treatment. Process annealing temperatures have a marked effect upon the resultant ultimate strength properties of the threads. The speaker also found in using modern type furnaces combined with good practice that effective process annealing treatments can be carried out at lower temperatures than previously were considered possible.

* * *

Possible Applications of the Cyclograph Principle to the Inspection of Wire, Wire Rope and Kindred Materials

DR. ELLIS' paper on the cyclograph came very near going over this correspondent's head into the end zone, but he managed to get a piece of it, and prevent a score. here is a little hickey, or widget, shaped like a wedding ring, that can be slipped over the end of a wire rope and thereafter the rope acts as the core of a transformer. As the rope runs through the hickey, which is wired to an indicator, variations in the section, as for instance those due to corrosion, and in physical state, as overwork might bring about, are traceable on the instrument. There is a lot of stuff about magnetic influences but it is just put in to make it look harder. Somebody take it from here.

Mill Practice — The Care and Maintenance of Dies

MANY plants are now going into drawing high carbon, fine wire, shape wire and some stainless steel and are planning to draw at higher speeds and in some cases special finishes. This information was brought out by **R. R. Preston**, Engineer, Carboloy Company, Inc., Pittsburgh, who presented a paper on "Mill Practice — Care and Maintenance of Dies." To accomplish the foregoing type of drawing efficiently, requires the close attention to mill layout, scheduling cleaning, lubrication, die room layout, and care of dies.

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THE author stressed the importance of scheduling the rod mill, particulary the cleaning department and each bench or group of benches a week ahead. When stock is not available the wire drawer is compelled to change the sizes of dies and this, the speaker contented, is costly.

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A time cycle and practice that will remove all scale must be established. Mills about to draw patented wire to fine sizes are faced with the necessity of spreading out the wire on yokes before immersing in the pickling bath in order to remove all scale. Production means higher speeds and this is obtained by better cleaning, according to the author.

* * *

THE liming operation is just as important as the pickling operation inasmuch as it plays a vital part in getting tonnage through the dies. Lime neutralizes any acid left on the surface, prevents rust, and is the lubricant carrier. Mr. Preston explained that the number of dips depends on the number of drafts to which the wire is subjected. Carbide dies will stand a lot of abuse but if the stock is improperly cleaned and limed, the die life will be affected. In drawing some sizes of high-carbon fine wire lime substitutes often are used. At some plants, the speaker pointed out, wire is cleaned, washed, and coated with a lime substitute before passing to the patenting furnace takeup frame. By this arrangement the life of the finishing dies has been increased from 8 to 72 hr. The speaker directed attention to the fact that in most cases present day wire drawers have not been properly instructed in the use of lubricants to get maximum life and best performance out of dies.

* * *

THE die room is the heart of the wire mill, **Mr. Preston** stated. Diemakers must be trained and supervised by one familiar with all operations in the die room and drawing practice. The supervisor should be given in advance a schedule of what is to be drawn in order that he may keep die racks well stocked with standard die sizes.

(*Please turn to page* 985)

BRITISH INDUSTRY FACING BIG EXPANSION

BELIEF that a big programme of expansion lies ahead of the British industry has been expressed repeatedly in recent months, subject to something of a catastrophic nature intervening to prevent the development of the present trend which is all towards the maximum output from existing plants and the establishment of others.

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DETAILS of this position as seen by the expert, engaged day in, day out, were given by **W. J. Terry**, chairman and managing director of the **London Electric Wire Company and Smiths, Ltd.**, on the occasion of the 37th annual report.

* * *

THE immediate future of this company is naturally bound up with the prospects of the electrical industry, which, but for some unforeseen occurrence of a catastrophic nature, promises a large expansion in both home and overseas markets. There is at the present time a sellers market, which, however, is subject to change without warning if existing demands are not satisfied before supplies are obtainable elsewhere, either from foreign sources or from the new industries, which are being established, particularly in the Dominions, who were previously large consumers of manufactures from the home country. Your management is conscious of this situation, and will do its utmost to overcome the difficulties relating to the supplies of materials and labour in order to meet the present abnormal demands.

* * *

A FURTHER need is that the manufacturers should be placed in a position to cover their requirements at fixed prices for deliveries to be extended over long periods — sometimes several years — to meet customers' demands, particularly in connection with large export orders. While speculation in essential commodities should be reduced to the lowest possible limit, it is handicapping to legitimate trading to prevent forward purchasing in accordance with the varied and changing needs of each individual concern. These conditions cannot be satisfied by bulk purchasing by the Government, especially when a short-term policy is adopted, as has recently been the case in regard to copper supplies.

* * *

THE world shortage of lead, now rationed, is likely to prove a severe handicap to the progress of the electrical industry which is a large consumer of lead, particularly for transmission cables. During 1945 supplies of our usual raw materials or alternatives were obtainable. There is, however, likely to be greater stringency for some essential commodities in the immediate future. In general, the company's stocks of raw materials have been maintained at a reasonable level so far as supplies have been available. Licences for extensions to existing buildings, however small and essential, have been practically unobtainable, although receiving full support in the initial stages. The later stages of following applications from pillar to post with dwindling success has retarded efficient working and development and left a sense of complete frustration.

* * *

IT would appear that factory extensions are only permitted in development areas. While it is readily admitted that everything possible should be done to bring new factories to the areas where there is surplus labour, it is surely a mistaken policy not to give building licences to established undertakings already giving full employment and unable to cope with current demands. To start a new industry in one of the development areas means a delay of at least a year in providing the buildings required, whereas an addition to an existing factory with the available auxiliary plant and requisite personnel could ensure production in a much shorter time.

* * *

SUPPLIES of labour throughout 1945 were quite inadequate, and the position deteriorated particularly as regards female employees, many of whom quite naturally have left industry to fulfil their domestic duties on the return of their menfolk now demobilised. This shortage greatly reduced our output, and has been the major problem of management during the period under review.

* * *

A BETTER supply of male labour is now forthcoming with the return of men from the Forces, and in this respect our labour position is improving. Labour rates were increased during 1945 and have again increased this year. As a result profits have decreased because there is necessarily a time-lag before increases in costs are recoverable in selling prices.

* * *

ALL debatable questions relating to labour have been negotiated with the trade unions concerned through the medium of the Joint Industrial Council and Allied Employers' National Federation, and settlements have been mutually agreed upon, with the result that harmonious personal relations have continued throughout the year.

* * *

THE company's output was lower during 1945 not because of a slackening in the demand for its produce, but entirely due to an in-

(*Please turn to page* 995)

GOVERNMENT WIRE PRODUCTION INFORMATION

Low Frequency Induction Furnaces

LOW-FREQUENCY electric induction furnaces were used widely and successfully by the Germans for the secondary melting of aluminum and aluminum alloys, according to a British report now on sale by the Office of Technical Services, Department of Commerce.

* * *

THE report was prepared by **W. J. Millar, V. O. Cutts, J. C. Harris and J. McDonald,** investigators for the British Intelligence Objectives Agency. It describes and evaluates the types of electric furnaces made by 14 of Germany's leading manufacturers.

* * *

GERMAN aluminum foundries used two types of melting furnaces — one designed by the Siemens-Schuckert Company of Berlin and the other by the Russ Elektroofen Corporation of Cologne. The Siemens furnace contains a horizontal slot, or channel, through which molten metal flows for secondary, induction heating. The slot in the Russ furnace is vertical. Both types of furnace are adaptations of the American Ajax-Wyatt brass melting induction furnace, acccording to the report.

* * *

THE British investigators were impressed with the thoroughness and the regularity with which the Germans kept the furnace slots clean. At least twice in every eight-hour shift operators emptied the furnace and scoured the slots with special tools. When the charge contained silicon impurities the furnace was scrubbed no less than three times in every shift.

* * *

THOUGH cleaning necessitated cooling the furnace, the refractory linings satisfactorily withstood thermal shock when the furnace received a new charge of molten aluminum, according to the report. The Germans estimated that, despite frequent coolings and cleanings, the linings lasted from five months to as much as a year or more.

* * *

IN addition to the induction melting furnace, the typical German aluminum foundry included a resistance-heated holding furnace of the flat hearth type and either a continuous casting machine for extruding or rolling billets, or a conveyer casting machine for producing notched bars. The charge placed in the induction furnace consisted of about 60 per cent virgin notched alloy bar and 40 per cent secondary scrap of similar composition.

* * *

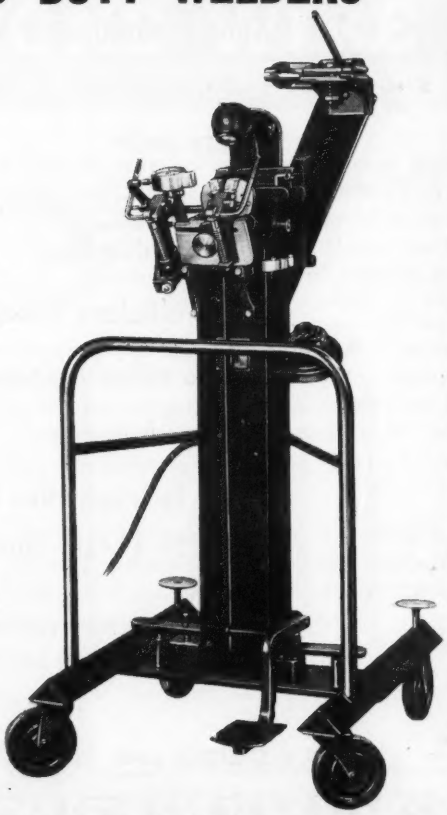
THE report also gives data on the design and operation of German resistance-heated furnaces. It discusses the metallic and nonmetallic heating elements, the salt baths, and other components of such furnaces. Included also are

MICROMETER PRECISION — MICRO-WELD — TRADE MARK REG. U. S. PAT. OFF.

MODELS J-3-S and J-4-S AUTOMATIC MICRO-WELD BUTT WELDERS

These welders are used for welding high and low carbon STEEL, and STEEL ALLOY wire, ranging in size from .020" to .160" diameter. All operations on these units, which include the clamping of the wire being welded, contacting the welding switch, and upsetting the weld, are made by a single downward stroke of the foot pedal. Welders for high carbon steel wire are equipped with the exclusive MICRO-WELD Dial indicating annealing device to facilitate the annealing operation on high carbon wire.

Standard equipment with these units include annealing dies, filing vise, light, extension cord, and mounted on a 4-wheel truck. Special units can be furnished for crane mounting.



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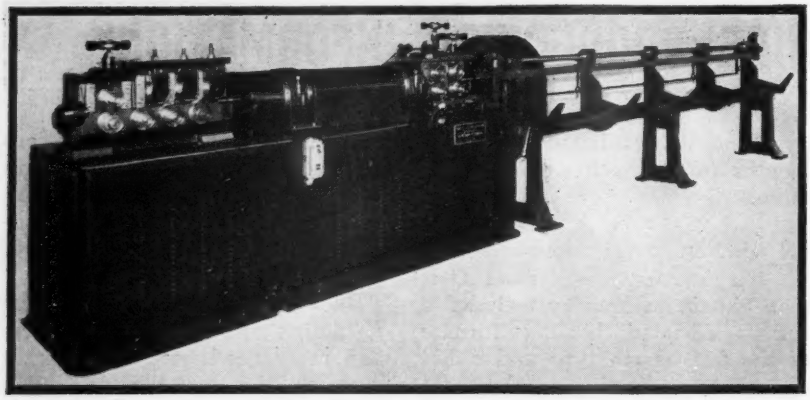

Type 3A — Cap. 3/16" — ⅝" Dia. (7/16" Dia. in Soft Stock)
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Some of the refinements developed in that time—

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Automatic WIRE STRAIGHTENING AND CUTTING MACHINES

descriptions of furnaces built especially for use in powder metallurgical processes.

German Pin Making Machine

A German pin-making machine with special cam devices to keep the pin wire moving at even tension is described in a British report, now on sale by the Office of Technical Services, Department of Commerce.

* * *

THE report, covering German manufacture of pins, bobby pins, and snap fasteners, was written by British industry experts for the British Intelligence Objectives Sub-Committee.

* * *

THE reciprocating actions of the primary feed, straightener, and gripper feeds, which carry the wire through the pin machine, assure an even pull. This smooth movement of the wire, achieved by an ingenious cam layout, prevents the appearance of spiral marks on the pins and permits high-speed operation, according to the investigators. The machine was designed and used by Wm. Prym, Stolberg. Maximum production of straight pins with the 130 machines in the Prym plant was 15 tons per 48-hour week. A diagram of the machine and a schematic layout of the cam system are included in the report.

* * *

INGENIOUS, mechanical movements in a Prym safety pin machine also are described in the report. The machine is fast running but more complicated than British models, according to the investigators. It probably requires more labor and a long training period for efficient operation. An unusual stem pointing machine used in the manufacture of safety pins by Dossmann & Co., Iserlohn, had similar defects.

* * *

IN general, German technology is considered by the investigators to be far behind the British in the manufacture of safety pins, bobby pins, and snap fasteners. German

firms had higher labor requirements than the British. The German industry maintained its competitive position on the world market before the war by the use of low-paid labor, inferior working conditions and export subsidies, according to the report. Considerable prison labor was used for carding and packaging the produtcs.

* * *

Japanese Pre-War Steels

JAPANESE pre-war steels were processed by methods similar to those used in the United States and England, but their low sulfur and phosphorus content indicated greater refinement, according to a report now on sale by the Office of Technical Services, Department of Commerce. The report was prepared by the U S. Naval Technical Mission to Japan. It describes Japanese methods for manufacturing steel used in armor piercing projectiles.

* * *

DURING the war, when nickel became a critical alloying element in Japan, substitute steels with little or no nickel were used, the report states. The phosphorus and sulfur content increased, an indication that the Japanese were unable to obtain good grades of pig iron. Most of the pig iron used in manufacturing acid open hearth steel was imported from Manchuria.

* * *

THE report contains brief descriptions of Japanese basic electric furnace steel, the acid open hearth process, and the basic open hearth process. Tabular data on special steels designed to save nickel, molybdenum, and tungsten (case hardening, structural, stainless steel plate, and heat resisting steel) are also contained in the report.

SEND IN
YOUR ORDER NOW
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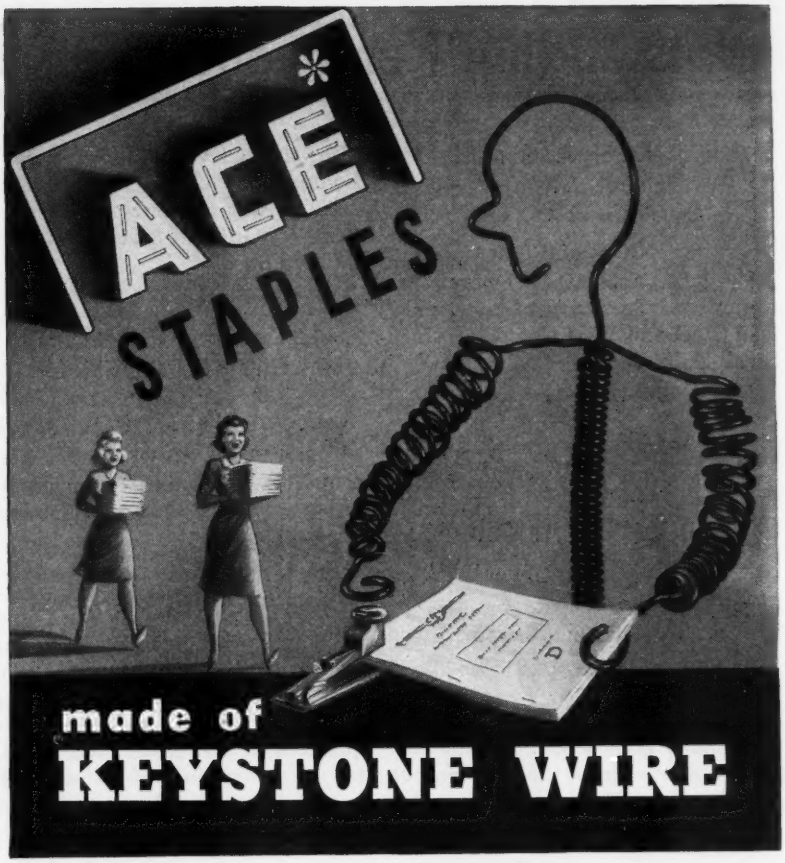
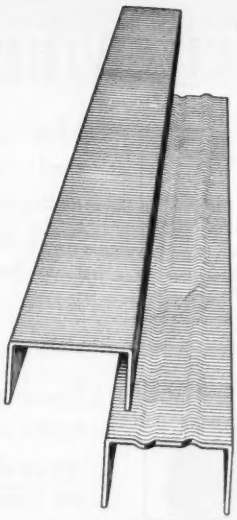
1946 WIRE BUYERS GUIDE





Precision wire is used in making Ace Staples. Essential requirements are high finish, close diameter and uniform temper to match the high degree of tooling and craftsmanship required to produce these staples.

Keystone preformed staple wire delivers these qualities in full measure. Many thousands of pounds of Keystone precision wire are used each month by the Ace Fastener Corporation, leaders in their field.

This is another example of the versatility of Keystone's research and development facilities. Whatever the wire need, Keystone can normally supply it.

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SPECIAL ANALYSIS WIRE
for all industrial purposes

KEYSTONE STEEL & WIRE COMPANY
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Outstanding Personalities of the Wire Industry

O.P. Moon Appointed General Attorney by A. S. & W. Co.

O. P. MOON of Pittsburgh has been appointed General Attorney and Secretary of the American Steel and Wire Company, U. S. Steel Subsidiary.

* * *

MR. Moon, a native of Lorain, Ohio, has been connected with the Law Department of Carnegie-Illinois Steel Corporation, another U. S. Steel Subsidiary, for the past three years. Prior to that he was engaged in the private practice of law in Cleveland and Lorain.

* * *

BORN in Lorain, Mr. Moon attended high school in that city and graduated from the Law School of Western Reserve University. From 1922 to 1930 he was associated with the Cleveland law firm of Ewing and Moon. From 1930 to 1943 he was a member of the legal firm of Glitson, Stack and Moon in Lorain.

* * *

Johnson Steel and Wire Co. Changes Sales Set-up

JOHNSON Steel & Wire Company, Inc., of Worcester, Massachusetts, announces realignment of its sales department officials effective October 1st.

* * *

ROBERT M. Jone, sales manager, will have his headquarters at the Wiser Avenue plant, Worcester. **Charles E. Reardon,** assistant sales manager, with headquarters in Worcester, will specialize in promotion of sales of the new Johnson developments in wire coatings and other new products.

William S. Darcey, formerly head of the New York sales offices in the Chrysler Building, has become sales market analyst. **E. Padron Wells** is now manager of export sales with offices in Chrysler Building, New York.

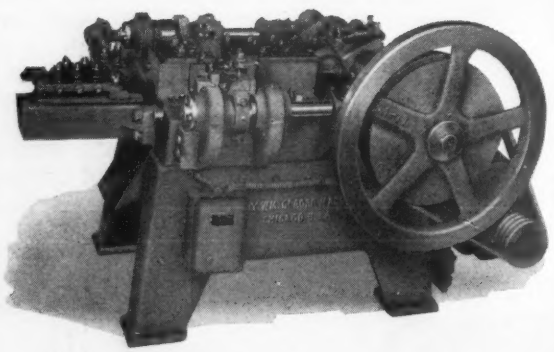
* * *

R. T. Dunlap, Executive Vice-President of Colorado Fuel & Iron

ROBERT T. Dunlap of Buffalo has been elected executive vice president of the **Colorado Fuel & Iron Corporation.** His headquarters will be in Buffalo. Mr. Dunlap came here as superintendent of the Wickwire-Spencer plant, now a division of Colorado Fuel, and later was advanced to the vice presidency in charge of all manufacturing operations.

* * *

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS

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Chicago 7, Illinois

The Dobeckum Company Announces Changes

T. F. Dolan, President of the **Dobeckmun Company**, Cleveland, Ohio, announces the election by the Board of Directors of **R. J. Christ** as Vice President and West Coast Division Manager, **R. C. Betts** as Vice President and Director of Technical Development, and the appointment of **T. E. Bruffy** to the newly created position of West Coast Sales Manager. **Warren E. Dierking** will replace Mr. Bruffy, as Los Angeles Sales Manager.

* * *

IN the industrial field, Dobeckmun are large manufacturers of plastic glazing, widely used in poultry houses and for hot beds and cold frames, in addition to many types of electrical insulation supplied as insulating tapes or as luminated electrical papers.

* * *

A recently introduced product which is assuming great importance in textile circles is the sensational, new non-tarnishing metallic yarn called "LUREX". It is normally used in a mixture of other fibres, giving a metallic accent to the finished material.

* * *

THE company's confidence in the future growth of converted films and foils is indicated by the investment in new plant and manufacturing facilities of nearly $2,000,000.

* * *

Percy Jenkins, President Insect Wire Screen Bureau

PERCY JENKINS, eastern sales manager of **Wickwire Spencer Steel**, has been elected president of the **Insect Wire Screening Bureau**, and **Stuart M Jones**, sales manager of **New York Wire Cloth Company**, has been named vice president. **Ralph W. Bacon** continues as secretary.

J. & L. Appointments

JOHN B. Mitchell, formerly assistant to the vice president in charge of manufacturing operations, **Jones & Laughlin Steel Corp.**, Pittsburgh, has been appointed general manager of manufacturing operations, and **Carl C. Henning**, formerly manager of raw materials, has been appointed general manager of raw materials.

* * *

Nichols Wire & Steel Co. Announce Appointment

WALTER J. Johnston, formerly in the export financial department of **Bethlehem Steel Co.**, New York, has been appointed to the position of assistant treasurer of **Nichols Wire & Steel Co.**, Davenport, Iowa.

* * *

WEAN EQUIPMENT Corporation

COLD ROLLING MACHINERY
For 36" Wide Material and Narrower
Mills · Reels · Slitters · Levelers · Coilers · Edgers
Scale Breakers · Shears · Scrap Ballers
Continuous Pickling

WIRE MILL EQUIPMENT
Wire Drawing Machines · Patenting
Galvanizing and Tinning Take-up Frames · Wire Flattening
Spoolers · Nail Galvanizing and Blueing

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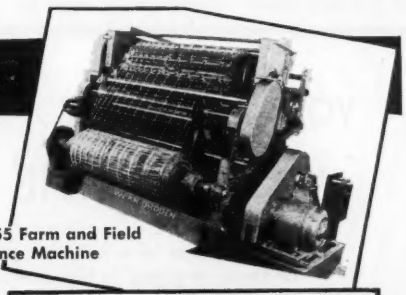
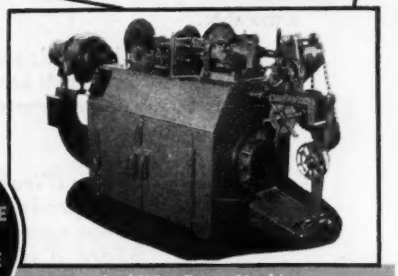
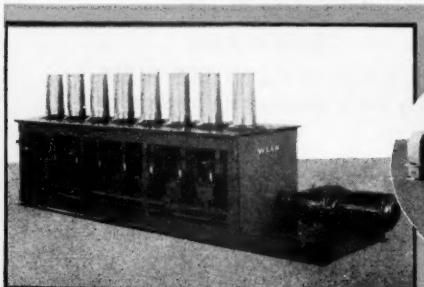
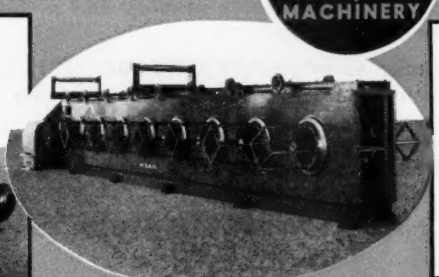
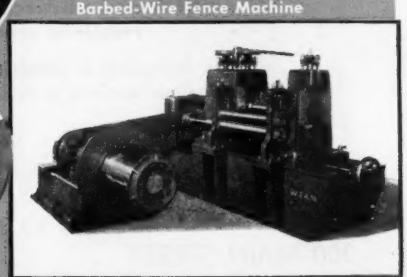

No. 1155 Farm and Field Fence Machine


Barbed-Wire Fence Machine

HOLMQUIST BARBED WIRE and WIRE FENCE MACHINERY


8 Block Fine Wire Tinning Take-up Frame


16 Block Wire Galvanizing Frame


Strip Reel and Slitting Unit

A Review of Recent Wire Patents

No. 2,408,367, TORPEDO NET, patented October 1, 1946 by Alan E. Brickman, New Haven, Conn., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

This net comprises a rope and interconnected wire mesh structure with a shock-absorbing seam between the rope and wire mesh structure, the seam giving under less stress than the connections in the mesh structure.

★ ★ ★

No. 2,408,368, WIRE REINFORCED FABRIC, patented October 1, 1946 by Alan E. Brickman, New Haven, Conn., assigner to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

Arranged in a plain weave, the threads of the fabric each comprise a stranded wire between latex-coated cords.

★ ★ ★

No. 2,408,416, SEMICONDUCTING COMPOSITION, patented October 1, 1946 by Donald E. Edgar, Westport, and David J. Sullivan, Fairfield, Conn., assignors to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware.

Adapted particularly for the manufacture of high tension electric cables, the inventors employ about the copper wires a resinous vehicle containing a non-drying oil modified alkyd resin, a polyvinyl acetal resin, a ureaformaldehyde resin and a carbon black having electrical resistivity of less than about 1.0 ohm per 1" cube in the proportion of between about 0.25 and 4 parts by weight of the resinous vehicle to 1 part of carbon black.

★ ★ ★

No. 2,408,424, PICKLING STEELS, patented October 1, 1946 by John J. Healy, Jr., Brookline, Maurice H. Taylor Stoneham, and Furio A. Abbiati, Longmeadow, Mass., assignors to Monsanto Chemical Company, St. Louis, Mo., a corporation of Delaware.

The method comprises immersing the steel in an aqueous acid reacting non-electroplytic pickline bath comprising essentially water, mineral acid and active pickling agents consisting of ferric sulfate and an alkali fluoride, the sulfate being present in the bath in an amount varying between 1 and 30% and the fluoride being present in an amount varying between 0.6 and 25%, the bath being substantially free of nitric acid.

★ ★ ★

No. 2,408,482, TORPEDO NET, patented October 1, 1946 by Harvey W. Riddle, Branford, Conn., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

In this net, a shock-absorbing seam is placed between net sections. The seam comprises two parallel stranded wire structures with a number of spaced apart connections between one of the wire structures and one section, a number of spaced-apart connections between the other wire structure and the second section, and connecting clips spaced from the connections for fastening the wire structures together.

★ ★ ★

No. 2,408,623, COATING FERROUS METALS WITH MOLTEN ALUMINUM, patented October 1, 1946, by Harvey N. Gilbert, Niagara Falls, N. Y., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware.

The process comprises pickling the iron with an acid medium to remove adhering oxide, washing the pickled article in water, and applying molten aluminum to the surface containing only water.

★ ★ ★

No. 2,408,686, MACHINE FOR SLOTTING SCREWS, patented October 1, 1946 by John A. Rush, Milton, Ontario, Canada, assignor to P. L. Robertson Mfg. Co., Limited, Milton, Ontario, Canada.

There are twelve claims. Among the objects of the invention is to prevent jamming when the blanks are removed from the feed hopper and conveyed to the slotter. And elevator mechanism is employed, leading from the hopper and including grooved rollers adapted to en-

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To those wire mill men who have not already joined the Wire Association for the mutual benefit of those engaged in the operating end of the Wire Industry, a cordial invitation is extended to become a member.

If you are making rods and wire—of steel, copper, brass, alloy or any ferrous or non-ferrous metal, or are in the wire products end—nails, bolts, screws, rivets, wire rope, wire cloth, springs, electric wire and cable or any of the numerous products made of wire, you will benefit by identifying yourself with the Association.

The Wire Association is a non-profit organization of wire and wire products mill superintendents, executives and foremen, whose specific purpose is to improve production methods and afford a clearing house for ideas on management, technical and research problems, and to develop and maintain friendly relations among members.

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RICHARD E. BROWN, Executive Secretary

300 MAIN STREET STAMFORD, CONN.

gage the heads of the blanks, with the shanks depending between the rollers, whereby the blanks are all delivered heads upwardly.

* * *

No. 2,409,394, ARMATURE WINDER, patented October 15, 1946 by Paul A. Schnebelen, Toledo, Ohio.

This winder comprises a non-magnetic support, a pair of arc-faced magnet opposite poles extending from the support and forming a seat complementary to a longitudinally slotted armature adapted to be magnetically locked therewith as an article of work, and non-magnetic guide wings mounted on the poles for directing wire to be wound directly to exposed slots adjacent the seat.

* * *

No. 2,409,530, ELECTRIC CABLE, patented October 15, 1946 by Charles E. Bennett, Ridgewood, N. J., assignor to The Okonite Company, Passaic, N. J., a corporation of New Jersey.

About the central wire conductor is a conventional paper insulation sheath and about this sheath and a wire conductor outside this sheath is an enclosing polyethylene tetrasulfide sheath, and an armor of paper impregnated with terpin hydrate.

* * *

No. 2,409,539, INSULATED WIRE AND CABLE, patented October 15, 1946 by Grover W. Brown, Wyckoff, N. J., assignor to The Okonite Company, Passaic, N. J., a corporation of New Jersey.

More specifically, the invention includes a method of marking the surface of the insulation of insulated wire and cable and vulcanizing the same in a continuous operation.

* * *

No. 2,410,126, MACHINE FOR IMPREGNATING ELECTRIC INSULATION, patented October 29, 1946 by John W. Olson, Hastings-on-Hudson, N. Y., assignor to Anaconda Wire and Cable Company, New York, N. Y., a corporation of Delaware.

Associated with the hot saturant bath-holding reservoir is a vacuum chamber in communication therewith and having a removable die at each end for sealing the ends of the chamber when the wire conductor and its covering is continuously drawn through the chamber and bath.

* * *

No. 2,410,127, MACHINE FOR IMPREGNATING ELECTRIC INSULATION, patented October 29, 1946 by John W. Olson, Hastings-on-Hudson, N. Y. and Charles W. Bechie, Sycamore, Ill., assignors to Anaconda Wire and Cable Company, New York, a corporation of Delaware.

This patent, associated with the foregoing one, includes means for heating the insulation covering of the wire, in the course of its travel towards the bath, until its moisture content is negligible, whereupon the dried insulation and the wire enter the vacuum chamber referred to above.

* * *

Oven Manufacturer Moves into New Plant

INDUSTRIAL Ovens, Inc. is the new name of the organization which up to now has been known as the Industrial Oven Engineering Company, according to an announcement made in Cleveland this week by **C. A. Litzler,** president of the new corporation. At the same time the company formally announced its establishment in its new plant and offices at 13825 Triskett Road, Cleveland 11, Ohio.

* * *

THE organization specializes in engineering, designing and installing industrial heating and processing equipment, with particular accent on continuous operations in the handling of the materials to be treated. "This change in name and in corporate structure," said Mr. Litzler, "is merely an external indication of the progress this company has enjoyed from its inception. Management and organization have been markedly expanded to keep pace with the continually increasing response to the engineering service and equipment we have been supplying in the oven-treating and processing fields."

* * *

"*Steelskin Brands*"
Reg. U. S. Patent Office

WIRE DRAWING SOAPS AND COMPOUNDS

RAW MATERIALS FOR SOAPS AND COMPOUNDS
ARE GENERALLY SCARCE.

To our present users—

Due to our fortunate raw material position we will continue to amply supply you.

To others who are interested in another source—

We invite your inquiry with the assurance that we can satisfactorily meet your demands.

WE PROCESS OUR SOAPS IN A SPECIAL MANNER TO GIVE UNEXCELLED PERFORMANCE FOR ALL TYPES OF WIRE DRAWING.

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HOMER 192

R. H. MILLER COMPANY

HOMER, NEW YORK
Established 35 years

Some Observations on German Cable Manufacture

(*Continued from page 967*)

which is similar to several others we have noted. It is a reinforced concrete stall — one at each exit. The first explanation is that it is a protection for a watcher to put out incendiaries, while others have gone to the air raid shelters. We note the port facing down the aisle and the two shelters provide a machine gun cover for the entire department. This is its primary purpose. We have noted before the poor lighting and general lack of conveniences, and cannot help but contrast this with similar departments in America. Machine guns replacing loud speakers and music.

Impregnated Paper Cables

WE walk rapidly through the impregnated paper cable department. The processes are well known and this part of German cable practice is perhaps better known than any other type. The paper cable departments have suffered the greatest damage from bombing, fire and sabotage. The heavier machinery is not badly affected but the paper taping, testing and other delicate apparatus is quite completely destroyed. Quality had deteriorated due to lack of materials such as paper, oil and jute. The compound used we find to be 75% mineral oil and 25% lemon resin. In some special case a mixture of mineral oil and Oppanol B3 had been used, but the high cost of Oppanol (Vistanex) was too high for general use.

Lead Presses

PURE lead was generally used for sheath. Where vibration was encountered — a Tellurium lead; lead-tin or lead-antimony alloy was used. Antimony had not been available for a long time.

* * *

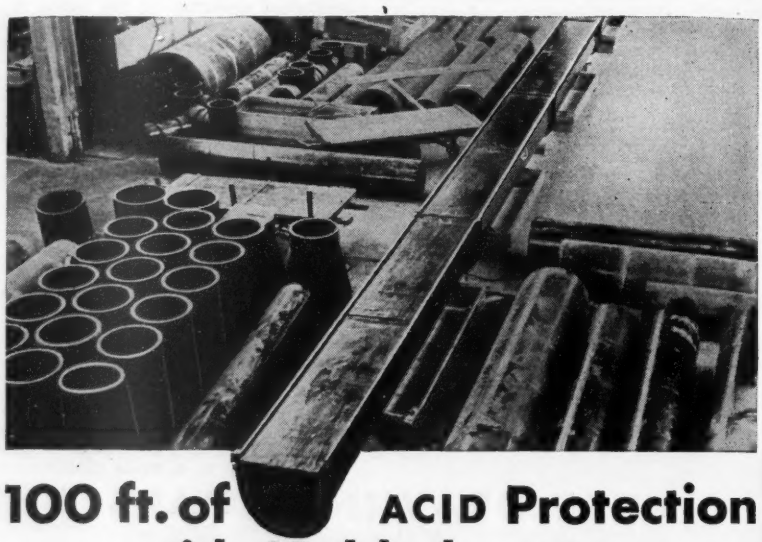
THE lead presses were made by **Krupp.** We are told that Hackethat have a **Henley** and Suddeutsche have a **Pirelli** extrusion type press. Aside from the greater use of electric die heating we find only standard practices.

Rubber Covering

AS we enter the Rubber Covered Department we notice several pieces of unfamiliar equipment and also the lack of Banbury mixing capacity. There is a **Banbury** 3½ and a **Werner** and **Pfleiderer** of about the same size. However, there is plenty of mill capacity. The strange equipment is a tunnel for the heat-treatment of Buna S prior to mixing. This treatment consists of carrying the Buna S as a sheet on a conveyor through a circulating air oven at a temperature of about 140°C. for from 30 to 60 minutes. The mixing and compounding have been previously described and we need not spend time on that phase.

* * *

THE use of mill mixing rather than Banbury has served well during the war. It has required more floor



100 ft. of ACID Protection with Molded HAVEG

The above illustration shows a 100′ long sectional HAVEG continuous strip pickling tank—just before it left the HAVEG plant to take its place in an important WAR PRODUCTS plant.

HAVEG was selected for this job because it had proved itself unaffected by the acids commonly encountered in pickling processes.

HAVEG is unaffected by Muriatic Acid, any concentration—even at boiling; is unaffected by Sulphuric Acid up to 50% concentration, and a grade is available which is highly resistant to Hydrofluoric Acid.

HAVEG has strength, toughness and durability. It is unaffected by rapid temperature changes and can be used continuously at temperatures as high as 265°F.

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space and more man power, but it has permitted continuing operation even though the plant is severely damaged with bombs and fire.

Insulating Process

THE process most used for insulating is the Strip or longitudinal process. For smaller sizes of wire such as field telephone wire or building wire, a 24 wire longitudinal covering machine is used. Production of field telephone wire on this machine is 60 Km in an 8 hour shift, or an average of 410 ft. per minute. Some of the conductor used for this wire consists of a solid No. 20 Awg. aluminum conductor around which are spiraled 6-12 mil high strength steel wires.

* * *

THE output from a **Berstoff** extrusion machine with 3″ worm extruding 3 wires at a time we find to be 36 Km or about 250 ft. per minute average. We do not find any continuous vulcanizing units in production, although we are told that there are some at Berlin. Naturally there are many three-roll calenders and an excellent sheet is made of 12 mil thickness.

* * *

THERE are several 12-wire strip covering units. These are so arranged that the cutters may be replaced and larger wire insulated on the same equipment. There would therefore be 12 - 8 - 4 - 2 - 1 cutter unit for the same machine. For larger sizes the wire is carried over to a heavy take-up and a taping head arranged to swing into place. We find that whereas strip method is used for insulation, extrusion is also used to a lesser extent for insulation, but is used almost exclusively for applying sheath.

* * *

THE largest cables have a wrapped sheath cured in tape. All jacketed cables under 1″ O.D. are cured in pans and in some cases on a drum which revolves during curing.

* * *

JACKETED cable from 1 to about 2″ O. D. are cured in lead and for cables larger than 2″ the compound is wrapped on and cured in tape — an overall wet tape is applied and both tapes are removed after vulcanizing.

* * *

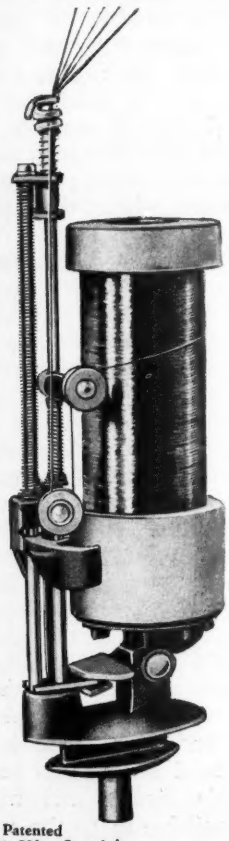
WE shall not endeavor to cover the compound formulation or further details of handling as these are covered quite completely in the reports we have from the Department of Commerce and listed below.

Testing and Repairs

WE note in passing that there is very little wire tank tested and that there are unusually large repair departments. One of our guides tell us that they were approaching the state where it required twice as many men to repair cables as to make them.

Taping

RUBBER is used only for voltages up to 3,000 volts and over 1,000 volts lead is required. However, lead is most difficult to obtain and



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a common substitute is known as **"Anthygron"** type. In this cable the twisted core was made round by extruding a compound made of Reclaim and Bitumen. This is one of the few places where reclaim is used. Over this core is applied a steel tape about 20 mils in thickness; zinc and aluminum tapes are also used. This tape is folded around the core with a longitudinally folded seam. These machines were manufactured by **Schumag** of Aachen —Rheinland, a place we heard considerably of and which is now one of our artillery's prize rubble heap.

* * *

OVER this tape is applied a cellophane tape and 4 asphalt saturated paper tapes, then a braid applied with a horizontal braider; following this, was a small saturating and finishing tank. Coal tar or asphalt when available was used. The entire covering was made in one operation.

* * *

WHERE the wire was intended for indoor use the metal covering alone was used and three small disks were rotated about the sheath to form a short lay helix into the sheath to afford greater flexibility.

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Extrusion Machines

MOST of the extrusion machines were made by **Hermann Berstoff** or **Paul Troister** both of Hanover. There are no particular features of these Berstoff machines except that some are provided with a special head to permit the insulating of three wires simultaneously. For smaller sizes of wire a straight thru machine was used. None of these machines were particularly efficient. Hot water or steam heat was used for rubber. For extruding plastics supplementary heating is applied to the die and head electrically.

* * *

MANY of the plastic extrusion machines are made by **Troister**. Special design for plastics were favored. The extruders for plastics differed in a number of details from those designed by the same firm for rubber. For rubber a single pitch screw was used, but for plastics a thread of variable decreasing pitch and increasing depth to maintain the volume of compound constant along the entire length of the screw was used. The screw is water cooled, chromium plated and mirror finish. A length to diameter ratio of 7 to 1 was maintained. The barrel of the extruder was grooved internally with six grooves about .5 MM deep running parallel to the axis of the screw. The barrel was left rough finished. Hot feed is used entirely and the compounds are approximately 75% Polyvinyl Chloride (Igelit) and 25% Plasticizer. In some cases 80-20 mixtures were used.

* * *

AS we examine one of these larger machines of **Troister** design, we find that it has a 6" screw. The head is set at an angle of 45°. Single, double and triple heads are available to fit the same machine. The inside surfaces of the head are chromium plated and

streamlined to avoid dead space. The barrel is electrically heated and thermostatically controlled with compressed air. We note that this machine is fitted with a triple head to run field telephone wire. The dies are arranged in a triangular configuration. Production with this stiff Polyvinyl Chloride compound is 400 ft. per minute or 1200 ft. total for the machine. We are told that a number of firms have several of these machines in use and they are apparently the most modern development in the extrusion of plastics.

* * *

OUR German guides show us an experimental plastic called **"Lupolen"**, recently developed by I.G. Farbenindustries. It is Polyethylene and is not yet in commercial production or use, although we are told Nor Deutsche Kabelwerke have made a submarine cable of it. The Germans obtained their first sample of Polyethylene from captured Allied airplanes, and are quite enthusiastic over it, but to date have had very little success in its application.

Braiding

WE pass through the braiding department and paper telephone cable department. All textile coverings are of Rayon or a substitute cotton made from wood fibre. It is very similar to cotton except lacks elongation. The type of braiding machine in larger number are textile type and **Guido Horn** high speed braiders. The latter machine takes a small package, is inferior to a **Wardwell**, and very noisy. There is nothing of further interest here and we walk through the paper telephone department where ingenious use is made of old equipment but familiar and conventional operations are carried out.

Mineral Insulated Cables

WE come at last to a small department in which all mineral insulated cables are produced. Such cables have had very limited application and have not been approved for German Naval vessels which they were originally intended for. Only a limited production has been attained but apparently considerable effort was expended on their development. Cable consists of an aluminum conductor with compressed magnesium oxide insulation and an aluminum sheath. Single, two and three conductor types of cable are on hand.

* * *

PERHAPS a brief inspection of the process of manufacture is warranted. The powdered magnesia, or a mixture of magnesia and Kieselkreide (a Siliceous Chalk), are mixed into a paste with water. A paste containing about 40% water is formed. This paste is then put into shallow pans about 1" deep and dried in an oven at 100°C. for six hours. This produces a hard hydrated magnesia cake. This cake is broken up into chunks and passed through a grinder which delivers particles about 1 sq. MM. These particles are then transferred to a fine grinding plate mill which delivers a fine ground uniform hydrated magnesia cake. This cake

MAINTENANCE DATA SHEET NO. 8

CALIBRATION - INCLINE - PLANE

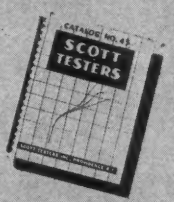
To check calibration of the IP-4 machine, weigh the carriage complete with all attachments (clamp, pen and weights for range to be checked). Carriage should weigh exactly twice the effective capacity (i.e. a 10-lb. cap. carriage should weigh 20 lbs.). On the IP-2, a 250-gram capacity carriage, complete with attachments, should weigh 591.51 grams—other capacities in same proportion. (A carriage weight should weigh an amount equal to the required capacity divided by the sine of the angle of maximum inclination.)

After determining that carriage weight is correct, see that rims of wheels and tracks are smooth and free of all dirt, rust, etc. Place carriage on track midway of its run. Adjust pen to rest in O horizontal on the chart. Then start the plane inclining. The line drawn will start vertical —indicating combined starting friction and inertia—but should move away from the vertical within the first two small spaces in the chart to indicate a satisfactory calibration.

If it does not, proceed as follows:

1. See that pen point is in good mechanical condition and sliding freely.
2. With commercial solvent and soft rag clean foreign materials from wheels and track.
3. Check tracking of wheels.
4. Remove wheels and wash ball bearings; repack per instructions.
5. Plain-bearing Wheels: Check condition of pivots, and indentation in axle and point in frame.
6. In replacing either type bearing, take care not to restrict rotation of wheel.
7. Check track alignment; tracks must be parallel and in same plane.

Here is the final "Scott Tester Data Sheet." Request any others you need to complete your Set of 8.



REQUEST "CATALOG & DATA BOOK NO. 45" describing the many Scott Testers for testing textiles, rubber, wire, paper, etc., up to 1 ton tensile.

SCOTT TESTERS, INC.

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powder is fed into a mechanical or automatic press which exerts about 15 tons of pressure and forms a firm dense moulded shape for one, two or three conductor cable. These moulded shapes are about 2″ long and 2″ diameter. These shapes are fired at 800°C. for two hours and while hot, strung on a 1/8″ mandrel inside an aluminum tube about .5 MM larger I.D. than the magnesia shape. The mandrel is withdrawn and the aluminum conductor inserted. The ends of the aluminum tube are then swaged down and then drawn down on a draw bench about 90 ft. long. The cable is annealed after each 4 passes and drawing continues on a bull block after the original 18 ft. length has become too long to handle on the draw bench. This type of cable was not used to any great extent and still presented many problems.

General Impressions

AND now that we have completed our visit we are asked what our overall impression of German Cable making. There is no doubt that great ingenuity has been exhibited in improvising processes and making substitutions for many critical materials. One German Technologist who had spent many years in America stated he had always admired American pioneering spirit, while Germans had to chart and plan everything, but that due to the exegencies of the war. Germans had gained some of that spirit in making rapid changes and repair. They certainly had a great deal of practice. However, the much vaunted Research had halted, as far as cables were concerned, in 1939 and since that time effort had been one of improvisation. Our judgment was that **there was no single plant in Germany which transported to America, could compete in a free economy.**

* * *

AS the war drew to a close there was no plant undamaged, some destroyed beyond repair. There were few paper cable, braiding, fine wire drawing, tinning or enameling departments which could possibly operate. Rubber insulating departments were perhaps 50% destroyed, and yet had there been no damage to these plants, production would have ceased as it actually had a month or more before the war ended, because of the complete destruction of transportation and consequent lack of coal and materials. Hitler's five years of war had fulfilled his promise: **"Give me five more years and you will not recognize Germany".**

* * *

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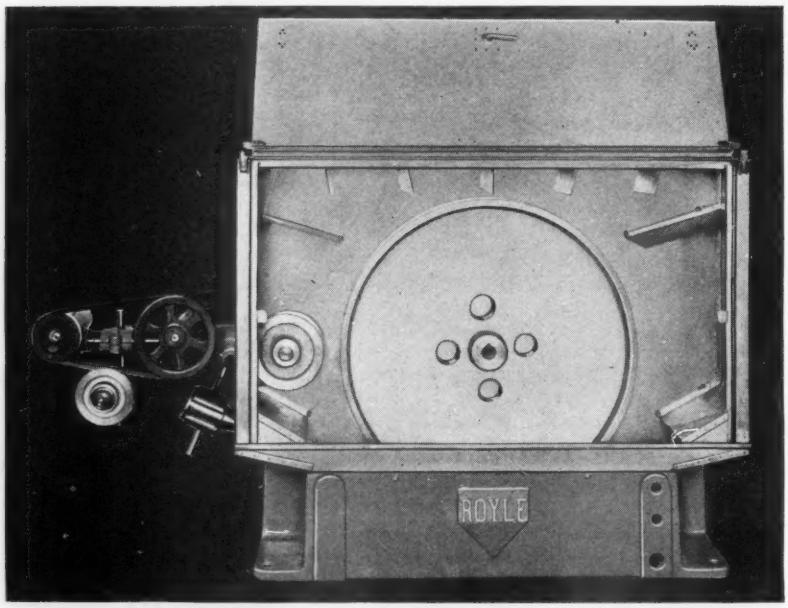

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R. A. Schatzel.
German Synthetic Insulation for Wire & Cable — WPB 'India Rubber World' November, 1945.
Rubber Age, August, 1945.

Highlights of the Convention

(*Continued from page* 971)

PLANTS that employ the most care in preparing their stock, and polishing their dies every 24 hr. obtain by far the best tonnage from their dies. Successful wire drawing is a result of a combination of proper cleaning and of correct lubrication, or of good dies, the speaker stated in conclusion.

★ ★ ★

DISCUSSION brought out the fact that carbide is held in place by cobalt. Warning was sounded concerning the care required in polishing the carbide die. Often in this operation the cobalt is smeared over the carbide before the latter is finished to a smooth surface so that when the die is placed in service results are not satisfactory. When wire is put through a newly polished die the first few feet take off the polish and leave a matted surface on the die. This according to comment, entraps lubricants and results in longer die life. Concensus of opinion was that lubrication is much better after polish is removed from the die.

★ ★ ★

THE hottest exchanges in the discussion were set in motion by a very pertinent question from **Sarup Singh Gill,** who surely wins the blue ribbon as the member who came furthest to the meeting. **Mr. Gill** wanted to get the consensus as to the degree of polish worth while in the die, a specially hard matter on which to dogmatize in view of the fact that there is no criterion of degree of polish anyway. There is no question that it can be shown in the laboratory that a high polish means a lower die pull. **In the laboratory,** I said. But there is one school of thought that holds that a matte fiinsh entraps lubricant; that a moderate degree of polish is dragged off after a few feet of wire have gone through, and better lubrication ensues. It has been noted that the first few fact of wire through a new die, the feet that the laboratory works on, are invariably shiny, and that as soon as the matte is established the wire settles down to the nice grey finish we like to see in process wire.

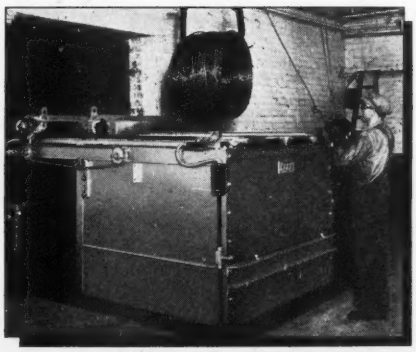
BUT there is another group of observers, damn their souls, who remind us that that phenomenon appeared back in the days of cast iron dies, and that the shine was due to the fact that the wire-drawer wiped off most of the lime from the end in the course of pointing. Well, have it your own way.

★ ★ ★

AS usual in die discussions, it was **Jim Longwell** who spoke

SPEEDY, SCALE-FREE WIRE ANNEALING

★



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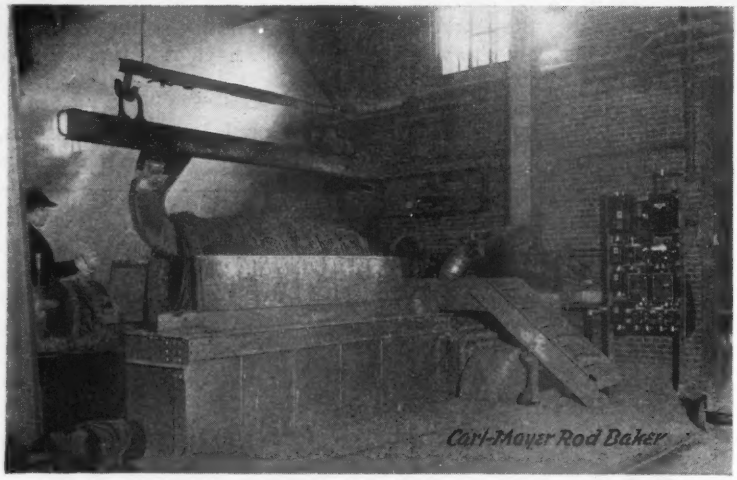

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the illuminating word. He warned us that many a high polish is simply the smearing of the cobalt binder over the carbide points and the polishing of the soft binder. Jim is a matte finish man, I think, though he seldom says anything quotable on the subject. But he is definitely an advocate of a flat cone. That's not exactly the word; there is a word that accurately describes a conical surface free from wash-board effect, but it is found only in treatises on spherical trigonometry and in cross word puzzles. Jim reminded us that a beautiful polish could be put on a practically worthless die, which led the chairman (who, because of the absence of Mr. Fraser happened to be the present writer) to sum up with the observation that many a slick finish distracted attention from a lousy shape, in this as in other walks of life.

* * *

Applications of Tin as a Coating Material

DR. B. W. Gonser, Battelle Memorial Institute, Columbus, O., in speaking on "Applications of Tin as a Coating Material" pointed out that molten fluxes permit the addition of tin chloride which deposits a thin coating on the metal and makes a fine mordant in dipping. The speaker pointed out that zinc cadmium in the proportion of 20 cadmium to 80 zinc is said to be a good substitute for tin. In the opinion of the speaker there is an indication that tin is becoming more available although it will be at least 1948 before supply of this metal will be sufficient.

* * *

DR. Gonser, gave us a chunk of meat that could easily have been carved up into five or six hearty meals. It is a mystery how he could have packed up so many hard facts into one paper and yet kept it so interesting all the way. Steps should be taken to get Dr. Gonser to split off the part that deals with wire coatings and expand it into a paper for some future meeting.

* * *

A Selection of Methods for Polishing Metallographic Specimens

IN a paper entitled "A Selection of Methods for Polishing Metallographic Specimens" by **F. G. Anderson,** Chief Metallurgist, and **R. E. McGraw,** Metallographist, National Lock Co., Rockford, Ill. the authors described three steps that are involved after filing for grinding the surface. The first is grinding on the lead lap; the second is the semipolish on a paraffin wheel; and the third is the final polish on the synthetic cloth. By this procedure there are fewer transfers of position and less time lost when cleaning and washing the hands between operations.

* * *

THE lead lap is made of solder instead of lead of either 50-50 or 70-30 grade. A conventional 8-in. polishing disk is set level and a band clamped around to form a sidewall ¼-in. high using a small asbestos string as stuffing against leakage. Solder is melted by a bunsen burner directed against the top of the disk until a pool ¼-in. deep is obtained. When cooled the band is removed and the disk mounted in a lathe to cut the top face smooth, flat and square. Grooves are cut with a 60° milling cutter 1/16-in. deep to form numerous cords instead of radii or spirals. Grooves are about ¼-in. apart and at 90° of one another to form ¼-in. squares. The lead lap is used for coarse grinding. By applying American optical 302 emery with water (one teaspoonful of emery in 200 cc water) directly on the rotating wheel while a specimen is lightly held against it, the solder soon becomes inpregnated and will not show signs of wear until several hundred samples have been prepared. After this it can be faced level without need of regrooving. After two or more refacings it can again be regrooved without cutting through the solder.

* * *

DURING the rough grinding stage the lead lap is kept wet by frequent application of water and emery mixture. The specimen is

Day after Day

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RODINE in the pickle bath assures a smooth, clean, bright surface which reduces the coating metal required for galvanizing or tin plating. A given amount of acid will clean a greater tonnage—it is possible with Rodine to schedule large production of pickled steel and be sure of getting it.

RODINE prevents marring the surface of threaded, machined or polished metal. The escape of noxious gases is controlled thus minimizing the corrosion of steel work in the pickle house.

RODINE is not itself a pickling acid, but small quantities of it control large quantities of pickling solution.

American Chemical Paint Co.
AMBLER ACP PENNA.

slowly moved across the wheel to various positions of the grinding path. The sample is given either a twisting motion to produce random directional scratches or held in such a manner that parallel scratches are produced. Grinding progresses readily without pressure on the sample and file marks or original grinding scratches are removed quickly. Wheels speeds between 200 and 600 rpm are satisfactory.

* * *

A flat surface thus is developed. The sample and mounting material are both cut evenly in the same plane, so that no time is lost in the next step.

* * *

INSTEAD of using a smoothly cut surface with grooves on the paraffin wheel, a naturally rough surface is produced by inherent solidification properties of two grades of paraffin with different melting points.

* * *

A brass or bronze disk must be used to which is fastened a retainer band holding a ¼-in. deep pool of molten paraffin. The disk is leveled so that rotation is in a true horizontal plane. Two parts of paraffin (68 to 72° C melting point) to one part of soft parawax is melted and poured on the disk to a thickness of ¼-in. When cool the paraffin is again melted with a long flame from a bunsen burner. When the disk becomes entirely visable the mass is cooled in still air to room temperature. Melting and cooling require about 70 min. and the surface is left with numerous small round projections or pimples to a uniform height. Incomplete remelting produces a surface that is too smooth: Overheating causes large wavey projections that are not satisfactory.

* * *

THIS wheel is operated between 200 and 600 rpm. Edges of the sample mount are beveled to avoid scraping the surface with any sharp edges. When the small projections become flattened after continued use the wheel will fail to grind and it is only necessary to scrape the surface reasonably clean and remelt and solidify the paraffin as before.

* * *

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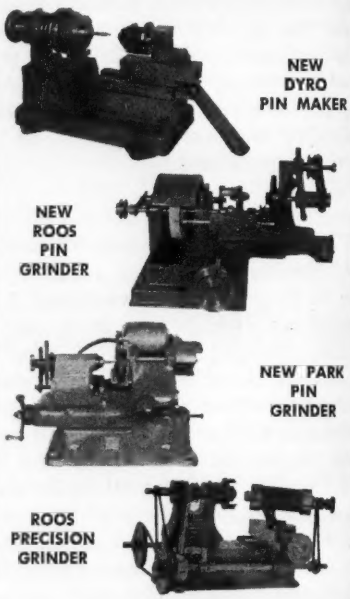
For speeding up production of Tungsten Carbide Dies and making lapping pins faster and with regular die room help. No special skill required.



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THE abrassive used on parafin wheels is one teaspoonful of 600 grit carborundum to 200 cc of soap solution consisting of 50 grams of green oil soap per liter of water. The sample is moved slowly across the wheel to remove the scratches previously produced by lead lapping. The surface condition should be inspected microscopically to make certain that the bottom of previous scratches are completely removed before proceeding to the final polish.

* * *

A synthetic cloth, known as **gamal** cloth, is used for final polishing. The flock or nap is rayon fiber about 0.0008-in. diameter and precut to 1/32-in. long. A dense pile is electrostatically driven into a layer of either rubber cement or Vinyl butyral that has been spread evenly over the base cloth. This cloth is waterproof; abrasives do not filter through and pile up under the cloth. The nap never becomes water soaked nor changes in physical characteristics when wetted. It polishes evenly across the entire surface of specimens. Inclusions can be retained even by reasonably prolonged polishing.

* * *

OPERATING speed of this wheel is about 250 rpm. Abrasive used is gamal concentrate diluted with 20 parts distilled water to one part of the concentrate and neutralized with triethanolamine to a ph. c. of 7 to 7½.

* * *

THE foregoing method of polishing meets the general requirements. Each wheel performs its task without much training or experience on the part of the operator. The weight of the sample supplies enough pressure on each of the wheels and the amount of abrasive is not critical. It is probably the most suitable for those laboratories which do not employ full time polishers.

Some Interesting Features of the Non-Ferrous Session

by Our "Not-So-Special" Correspondent

THE first paper of the Thursday morning session was on "Aluminum Wire Fabrication", presented by Mr. W. E. King, Chief Metallurgist of the Aluminum Company of America, in the absence of Mr. H. S. Spaulding, the author. It was quite evident that Mr. King knew his subject thoroughly for he was able to answer satisfactorily the many questions put to him from the floor. Questions were asked about rod production, drawing schedules, lubricants and all such details in which a wire manufacturer is interested. He brought out clearly that the manufacture of aluminum wire is no longer a novelty and the "wise" ones in the non-ferrous field who have attempted to belittle the importance of aluminum wire as compared with copper, brass and other non-ferrous metal wire will see that the era of light metals is here to stay even in the wire industry.

* * *

MR. H. B. Slade, Electrical Research Engineer of the Okonite Company, presented a very interesting paper on "Synthetics for Wire and Cable". For those in the industry who are thoroughly conversant with the tremendous strides made in recent years in developing synthetic compounds for insulating wire and cable, Mr. Slade's paper probably contained little that was new, but for most of us it was interesting to learn that these insulating compounds can be roughly divided into two classes: (A) those which are vulcanizable and, (B) those that cannot be vulcanized. Each of these groups has its special uses and, in fact, some of them can now be substituted for the lead sheathing commonly used in cable manufacture. Quite a number of questions were asked from the floor, all of which were readily answered by Mr. Slade.

* * *

THE third paper was by Mr. R. A. Schatzel, Vice President and Director of Engineering of the Rome Cable Corporation. Mr. Schatzel has only recently returned from a visit to Germany where he was sent by the Government to report on the wire industry in Germany. At the outset Mr. Schatzel said that he was merely going to give us a sort of travelog rather than a technical description of the various plants he had visited. To emphasize

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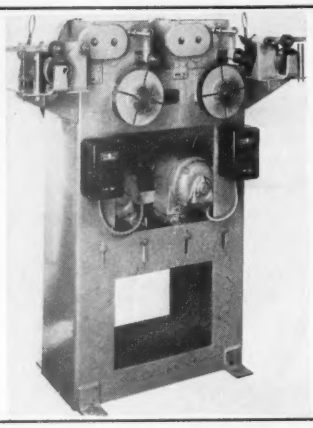

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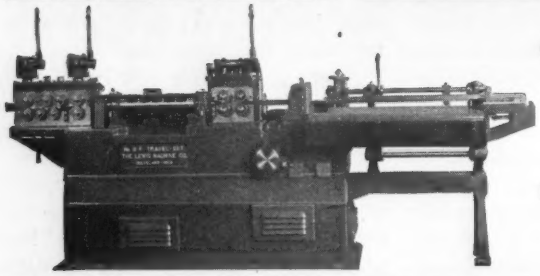

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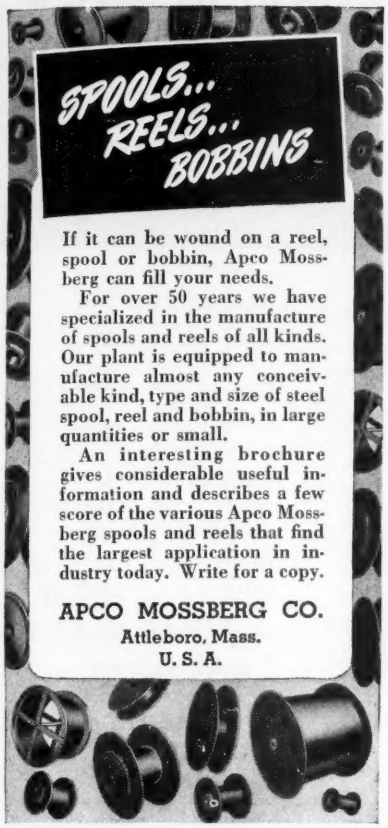
his point he showed a few pictures of the devastated areas in Germany and pointed out that while the scenes depicted were typical, many mills were able to operate despite the outward appearance of destruction. A plant might receive a direct hit and the side walls and roof be demolished, but unless the bomb struck the wire drawing machine itself, or the drive mechanism, it would continue to operate so long as material was available. The discipline which is instilled in all German workmen and the fact that they had considerable slave labor available made it possible to maintain wire production at a fairly high rate until nearly the end of the War. Mr. Schatzel gave a very interesting description of a plant devoted to the rolling of aluminum and copper so that if one followed closely, one could imagine being escorted through the mill by a competent guide. However, it was evident after listening to this interesting description, that no important improvements in rod and wire production had been made in Germany and that American industries did not lose very much by having been cut off from that country during the War. Mr. Schatzel described briefly the method used in making copper trolley wire starting with an 800 pound wire bar and outlined the method used in manufacturing composite trolley wire in which the first step is to shrink a copper tube around a steel billet. The Germans used synthetic insulations and had developed them at about the same rate as in other countries, but the preference appeared to be for a nylon type insulation which could be used for the largest number of purposes. In conclusion, Mr. Schatzel stated that much of the efficiency of the German mills could be attributed to the iron discipline maintained and the use of slave labor. It was a case of substituting machine guns for loud speakers and radios to obtain maximum production. Mr. Schatzel was of the opinion that neither the equipment itself nor the general set-up of these German plants was such that if they were transplanted to the United States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and had to be operated under a free economy, could they compete with modern American wire mills. He was roundly applauded for his very excellent discourse and it was quite evident that all present had enjoyed it very much.

* * *

MR. George A. Fowles, Manager of the Wire and Cable Material and Chemical Division of the B. F. Goodrich Co., Cleveland, Ohio, carried out the duties of Chairman of the morning session in most commendable fashion. His remarks were stimulating and the discussion from the floor kept from wandering into strange channels.

* * *

AFTERNOON SESSION: The afternoon non-ferrous session started off with a paper by Mr. D. Short, Electrical Engineer of the Canada Wire & Cable Co., Ltd. of Toronto, Canada. The subject was "Synthetic Insulants in the Cable Industry". Mr. Short's presentation was largely in the nature of a thorough review rather than a disclosure of new developments. He stated that Neoprene was the synthetic insulent which behaved more nearly like natural rubber and was the one most widely used. He also spoke of the synthetic resins of which we have heard so much and stated that their number seemed to increase daily. There was a brief discussion which appeared to be of considerable interest to those participating.

* * *

THE second paper of the afternoon was by Mr. Fred F. Sampson, Jr., Engineer in charge of the Wire and Cable Section of the Insulated Wire Division of Owens-Corning Fiberglas Corp., Toledo, Ohio. His paper, "Application of Fiberglas to Wire and Cable", was a rather non-technical discussion of the characteristics of Fiberglas. He reviewed the advantages and limitations of this material when used as insulation for electrical conductors including those made of aluminum. Among the interesting new developments on which he reported was the production of colored glass

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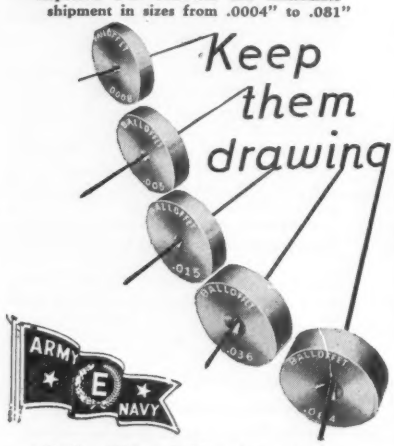

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yarn and some fiberglas insulation that will withstand temperatures up to 2,000 degrees F., but unfortunately it hasn't much flexibility. At the conclusion of his text Mr. Sampson showed various types of glass insulation and the manner in which the yarns are applied.

* * *

THE final item on the non-ferrous session program was a motion picture entitled, "Noranda Enterprises". This movie started with the discovery of the mine and its gradual development from the early stages to the establishment of a veritable "city in the wilderness". The picture traced the manufacturing of copper wire from its initial mining through the smelting and refining processes ending with the production of the wire bars which are shipped to the Canada Wire and Cable Co's plants in Toronto. There the bars are rolled into rods drawn into wire and if required stranded and insulated to make the finished cable. It is well known the copper ore is also rich in gold and silver and, therefore, the plant has had to install an electrolytic silver and gold refinery.

* * *

MR. H. B. Carnahan, Assistant Works Manager of the Canada Wire and Cable Co., Ltd., Toronto, Canada, proved to be an excellent chairman of this very interesting afternoon session of the non-ferrous section of the annual meeting.

* * *

THOSE in the Wire Association who were responsible for the non-ferrous program are to be congratulated for the fine work they performed this year. Judged by the attendance and the extended discussions, the members got keen enjoyment from listening to the papers presented. The attendance was much larger than in previous years and it is safe to say that the younger sister of the Association, the non-ferrous section, is growing fast and may soon be as important as the ferrous section. Our worthy Executive Secretary tells us that a verbatim report of all of the technical sessions will appear in forthcoming issues of "Wire and Wire Products."

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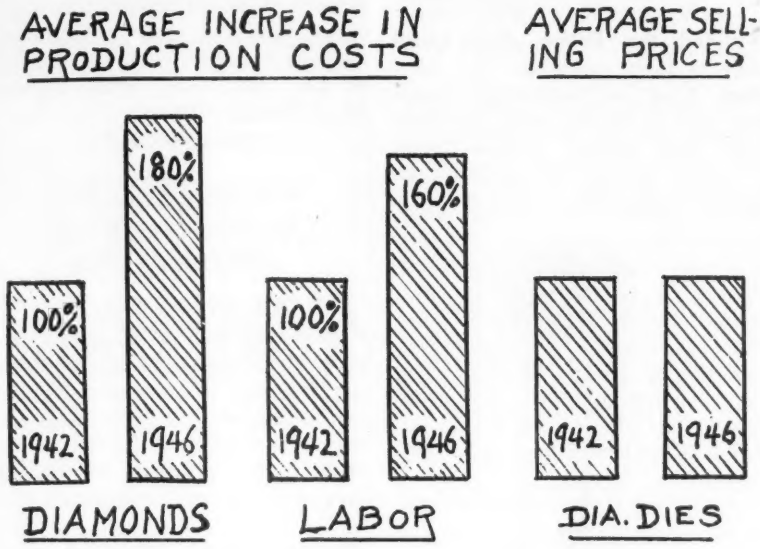
Die Makers Committee Report



THE Die Makers Committee of the **Industrial Diamond Association of America, Inc.**, has reported to the Board of Directors that the diamond die industry is working under great odds due to a certain extent to the rising cost of labor and more especially to the great increase in cost of first quality stones suitable for manufacturing first quality dies. This is due to the shortage of this material, the same conditions applying to the diamond bortz for powder purposes. The I.D.A. has canvassed the whole field of diamond die manufacturers for comprehensive information on the subject and, in order to acquaint not only the diamond die industry but also the users of diamond dies, a chart has been prepared showing the increase in cost of labor and material since 1942. However, due to the demoralized conditions in the diamond die industry, the selling price is far too low for this industry to prosper and give the diamond die users the same service and quality as given previously and to which they are entitled.

* * *

THE accompanying chart indicates the average increase in cost of producing diamond dies and that the average selling prices remain unchanged, the years covered being 1942 and 1946. The cost of good diestones in 1946 is shown as 180% as compared with 100% in 1942 and of labor in 1946 of 160% as compared with 100% in 1942.

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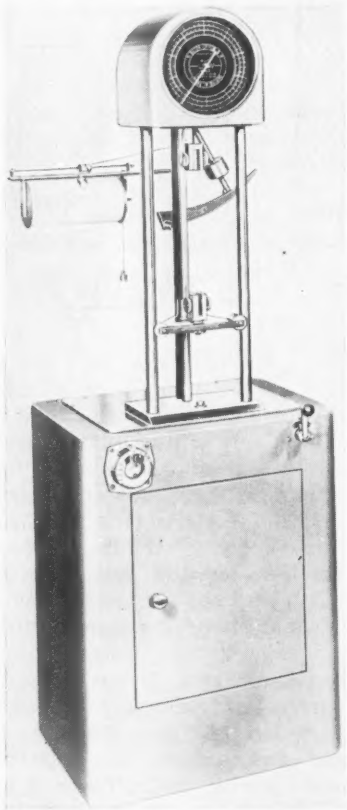

New Dillon Tester ★ ★ ★

THE device is so arranged that after the upper grip is set, the indicating dial may be set at exact zero so that the dial reading recording the pull is accurate. These testers are also supplied as standard equipment with limiting switches to prevent accidental overrun at the top or bottom.

★ ★ ★

DILLON Testers are supplied with a motorization system with the transmission mounted directly on the motor. A forward and reverse lever in front of the operator controls readily the upward or downward movement of the platen.

BESIDES the Multi-Low-Range tester, other models are available for heavier work, and special grips can be furnished for testing other than for wire. Full details may be secured from **W. C. Dillon & Co., Inc.**, 5410 West Harrison St., Chicago, Illinois.

★ ★ ★

Fine Steel Wire Seen Replacing Textiles for Heavy-Duty Tires

AMERICAN **Steel & Wire Co.** subsidiary of United States Steel Corp. has developed and now is producing in commercial quantities an exceedingly fine steel wire which is expected to largely replace textile products in manufacture of heavy-duty automotive tires, the company disclosed recently. Manufacture of the wire, which is only .0059 of an inch in diameter, is being carried out at the Cleveland plant of the wire unit.

★ ★ ★

WIRE has already been used extensively in tires to provide a core for the bead which holds the casing on the rim of the wheel. The new steel strands are used to form the plies or layers of material which are saturated with rubber and form the inner core or body of the tire. Used in heavy-duty tires during the war, the product proved of great value in providing longer life for casings and conserving critical rubber.

★ ★ ★

THREE of the fine wires are twisted into a strand and six strands are laid around a central core to form a cord one thirty-second of an inch in diameter. Numbers of these cords are then placed parallel with each other and coated with rubber, forming a ply of great strength and resistance for use in tire construction. When three or four of these plies are laid with the wires in each running at an angle in the next ply, a strong, flexible foundation is afforded for applications of the tread rubber.

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according to the company spokesmen. More rubber is required to saturate one metallic ply than a fabric ply, but the over-all saving in rubber due to the fewer plies is very substantial, it was pointed out.

* * *

THE metal sheath formed by the process, it is also claimed, shows much greater resistance to punctures, bruises and blowouts and the thinner structure provides greater resiliency and eliminates the creation of excessive heat which is so destructive to rubber. The metal core ply also eliminates casing stretch, which lowers the density of tire rubber and contributes to wear.

* * *

DUE to the wrenching and bending to which the cords are subjected, the wire used in their production must be of extremely high grade, with tensile strengths ranging from 325,000 to 400,000 pounds a square inch. The most rigid controls are exercised in the manufacture of the steel and in the subsequent drawing of the wire and forming of the cords.

* * *

British Industry Facing Big Expansion

(*Continued on page* 972)

adequate supply of labour, particularly women. Orders outstanding on the books represent a large tonnage, which is steadily increasing. Exports increased during 1945 and could be considerably expanded up to and even beyond pre-war levels if both labour and materials were in full supply.

* * *

THE various trade associations connected with this industry have rendered invaluable service to the community. They will continue to do so in the exchange of information between members and by fixing selling prices based upon efficient cost of production, which is ultimately to the benefit of the consumer. The British Non-Ferrous Metals Federation — mentioned last year — has made an excellent start. It is already taking a leading part in the affairs of this industry and giving valuable assistance to research and Government Departments.

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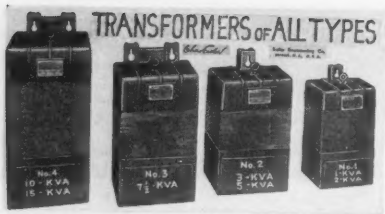

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(*Continued from page* 960)

ditions does not involve recutting to larger sizes.

* * *

THE layout hereon the chart shows a correctly arranged and well equipped die room. This can handle dies from blanks up to dies in 4-inch cases or larger depending on the size of the lathe. It is also equipped to handle shape dies of all types.

* * *

THE quantity of dies accommodated in a die room of this size depends entirely upon: (1) the condition of the dies when work is started on them and; (2) the amount of stock to be removed in either the making of new dies, or the resizing or repolishing of dies previously in service. On the ten-spindle drilling machine, for example, blank dies can be pierced at the rate of approximately sixty dies in eight hours by an experienced operator.

* * *

IT is important that the operation of the die room be carefully organized for maximum efficiency. This chart shows what you could well consider an ideal flow of work. The entire procedure is based upon the systematic classification and storage of dies according to the operation or operations necessary to put each die into service. Here is a typical routing procedure:

* * *

ALL dies are given out and turned in at the service window. They are immediately cleaned and inspected to determine the work required. Dies needing polishing only are placed in the repolishing rack for that purpose. After repolishing they are transferred to finished die racks until returned to service.

* * *

IF dies need resizing as well as repolishing, they are placed in second rack. After repolishing, dies are transferred to third rack, and from there they go to finishing machines for resizing. After resizing they are placed in the finished die racks.

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DIES needing rough drilling are put in rack No. 4 and after rough drilling, rack No. 2 for polishing. Then they go to rack No. 3 for resizing and finally to the finished die racks.

* * *

NEW dies are started at the rough drilling or 10-spindle machine, then handled the same as a die being reserviced.

* * *

THE two types of die racks that have been suggested — that is, the finished die rack and the auxiliary die racks — are shown here.

* * *

THE die room layout here is of course, a general one, and it is subject to adjustment to meet specific needs of your own mill.

* * *

AS a concrete example of what servicing will do, one plant got as high as 1500 tons through their dies and the dies were still on size when the drawing was stopped. Some plants only got 300 to 400 tons and the dies were worn oversize. The answer, of course, is in some measure due to the condition of the rolled rod, but in general, preparation of the stock and care of the dies was the answer. The plants that took the most care in preparing their stock, and polished their dies every 24 hours —removing any ring that had formed — got by far the best tonnage through their dies. I have given you this only as an example, as I think it applies to any kind or size wire you may be drawing.

* * *

IN closing, I want to re-emphasize one thing: the successful drawing of any wire whether it be high carbon, low carbon, or shape wire, is not alone a result of proper cleaning or of correct lubrication or of good dies. It is a combination of each and every one of these factors. Make sure each of these important phases of your operations is at maximum efficiency, and you can be certain of a big improvement in results in your mill.

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For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyers' Guide.

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Norton Co., Worcester, Mass.

ACID INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

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Haveg Corporation, Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

AIR DRAW FURNACES
Carl-Mayer Corp., Cleveland, Ohio.

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American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Perth Amboy, N. J.

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National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J

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New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

BENDERS—
O'Neil-Irwin Mfg. Co,. Minneapolis,. Minn.

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Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

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Norton Co., Worcester. Mass.

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Entwistle, Jas. L. Co., Pawtucket, R. I.

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CABLE—Steel and Copper
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

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Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.

CASTINGS—Wire Mill
Scudder, E. J. Fdry. & Mach. Co., Trenton, N.J.

CEMENTS—Acid Proof
Sauereisen Cements Co., Pittsburgh, Pa.
Ceilcote Co., The, Cleveland, Ohio.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

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Apex Alkali Products Co., Philadelphia, Pa.
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Standard Industrial Compounds Co., Chicago, Ill.

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Apex Alkali Products Co., Phila, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

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Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co.. Cleveland. Ohio.

CLOTH TESTERS—
Scott Testers, Inc., Providence, R. I.

CLOTH—WIRE. All Metals
Reynolds Wire Co., Dixon, Ill.
Roebling's John A. Sons, Co., Trenton, N. J.

COATING COMPOUNDS—
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Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

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Torrington Mfg. Co., Torrington, Conn.
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COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
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Apex Alkali Products Co., Philadelphia, Pa.
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Shell Oil Co., Inc., New York, N. Y.

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American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila, Pa.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Phila., Pa.
Bick, Hans C., Inc., Reading, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Shell Oil Co., Inc., New York, N. Y.
Standard Industrial Compounds, Co., Chicago, Ill.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
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CUTTING TOOLS—Carbide
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Vascoloy-Ramet Corp., North Chicago. Ill.

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Porter, H. K., Inc., Everett, Mass.

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Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside. N. J.

DIAMOND POWDERS—
Michigan Wire Die Co., Detroit, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND TOOLS—
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co.. Inc., Guttenberg, N.J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
New England Wire Die Co., Worcester, Mass.
North American Philips Co. Inc., Dobbs Ferry, N.Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Lead Extrusion
Wayne Wire Die Co., Hillside, N. J.
Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies Co., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Co., Detroit, Mich.
New Eng. Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Works, Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

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Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

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Standard Machinery Co, Providence, R I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Hubbard Spool Company, Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

DRYING & PRE-HEATING ROOMS—
Carl-Mayer Corp., Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

ENGINEERS—Consulting Wire Mill
Lewis, Kenneth B., Worcester, Mass
Syer, C. Raymond, Westport, Conn.
Wiel, L. D., New York, N. Y.

EQUIPMENT—Insulation Testing
Entwistle, James L., Co., Pawtucket, R. I

EYELETS—Brass or Zinc
Platt Bros., & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

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Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

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Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.

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Ajax Electric Co., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES— POT (Oil, Gas, Electric)
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FURNACES—Salth Bath
Ajax Electric Co., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corporation, Toledo, O.

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Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corporation, Toledo, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GOVERNMENT SURPLUS MATERIALS
War Assets Corporation, New York, N Y.

GRINDERS—Roll
Norton Co., Worcester, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of Cleveland.
Crane & Engineering Co., Wickliffe, Ohio.

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American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M. Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
Industrial Ovens, Inc., Cleveland, Ohio.

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General Electric Co., Schenectady, N. Y.
Owens-Corning Fiberglas Corp., Toledo, Ohio.
Standard Varnish Wks., Staten Island, N. Y.

KETTLES—Galvanizing, Annealing, Tinning, etc.
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Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N.J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

LIME—
Warner & Co., Philadelphia & Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Celcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, K. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Phila., Pa.
Dick, Hans C., Inc., Reading, Pa.
Miller, K. H., Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Rope)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., The, Bridgeport, Conn.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Entwistle, Jas. L. Co., Pawtucket, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Coilers
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Copper Wire Drawing and Rolling
American Insulating Mach'y Co., Phila, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila, Pa.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Inc., Cleveland, Ohio.
National Mach'y Exch., (Used), New York, N.Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Porter, H. K. Inc., Everett, Mass.
Shuster, F. B. Mfg., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Roos, H. & G., Tool & Mfg. Co. Montclair, N.J.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, O.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
Robertson John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Fence
Glader, Wm. Machine Works, Chicago, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Forming
Eisler Engineering Co., Newark, N. J.
National Mach'y Exch. (Used), New York, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Seifert, E. R., Inc., Syracuse, N. Y.
Sleeper & Hartley, Inc, Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Galvanizing
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co, Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail, Div. of the Cleveland.
Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm. Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

WHERE TO BUY, Continued

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Pointing
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber for Insulating Wire
Royle, John & Sons, Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Screw Wire
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc, Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila, Pa.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs).
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N .J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Mach'y Exch. (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N .J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N .J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing Equipment—Sparkers
Entwistle, Jas. L., Pawtucket, R. I.

MACHINERY—Testing Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Industrial Ovens, Inc., Cleveland, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila, Pa.
Eisler Engineering Co., Newark, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc, Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J .

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER—For Coil Wrapping and Corrosion Prevention
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D.C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING TANK LININGS—
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

PIPES & FITTINGS—Acid Resistant
Ceilcote, Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio.

POTS—Lead Melting
National Annealing Box Co, Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co,. Phila, Pa.
Miller, R. H., Co., Inc., Homer, N. Y
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc, Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REELS—Annealing and Stranding
Howsam Spool Co., Aurora, Ill.

REEL AND TENSION STAND—
Industrial Ovens, Inc., Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Sleeper & Hartley, Inc, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

WHERE TO BUY, Continued

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hayward R. B. Co., Chicago, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hayward R. B. Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Stevens Metal Products Co., Niles, Ohio.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hayward R. B. Co., Chicago, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hayward R. B. Co., Chicago, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N.Y.

RODS—Nickel Alloy
International Nickel Co., Inc., New York, N. Y.

RODS—Stainless Steel
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

ROLL STRAIGHTENERS—
Moslo Machinery Co., Cleveland, Ohio.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

SATURATION SYSTEMS
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Shell Oil Co., Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

SPOOLING—Wire
Jersey Specialty Co., Little Falls, N. J.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hayward R. B. Co., Chicago, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company,. Chicago, Ill
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

SPRINGS—Tools for Forming
State Machine Tool Co., Hartford, Conn.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANK LININGS—Brick
Ceilcote Co., The, Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.

TANK—Compound
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Sanereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
National Annealing Box Co., Washington, Penna.

TOOLS—Spring Forming
State Machine Tool Co., Hartford, Conn.

TOOLS—Wire Cutting
Porter H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

TREADS—Safety
Norton Co, Worcester, Mass.

TUBE BENDERS AND FORMERS—
Ruesch, H. J. Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power
Standard Machinery Co., Providence, R. I.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—For Insulation
Standard Varnish Wks., Staten Island, N. Y.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila, Pa.
Entwistle, James L. Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, O.
Watson Machine Co., Paterson, N. J.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa.
Malin & Co., Cleveland, Ohio.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland-Chicago-New York
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
U. S. Steel Export, N. Y., N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Enameled for Coils
North American Philips Co. Inc. Dobbs Ferry, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Amer. Steel & Wire Co., Clev. - Chicago, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth Sterling Steel Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Reynolds Wire Co., Dixon, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.
U. S. Steel Export, N. Y., N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.

WIRE—Nickel & Nickel Alloy
North American Philips Co. Inc. Dobbs Ferry, N. Y.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specification for Special Purposes
Hudson Wire Co., Ossining, N. Y.
North American Philips Co., Inc., Dobbs Ferry, N. Y.
Winsted Div. of Hudson Wire Co., Winsted Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
Amer. Steel & Wire Co., Clev. - Chicago, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.
U. S. Steel Export, N. Y., N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's John A., Sons Co., Trenton, N. J.
Reynolds Wire Co., Dixon, Ill.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Reynolds Wire Co., Dixon, Ill.

WIRE WINDER
Standard Mill Supply Co., Providence, R. I.

WRAPPING PAPER—Creped
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YARNS & TAPES—
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General Electric Co., Schenectady, N. Y.
Owens Corning Fiberglas Corp., Toledo, Ohio.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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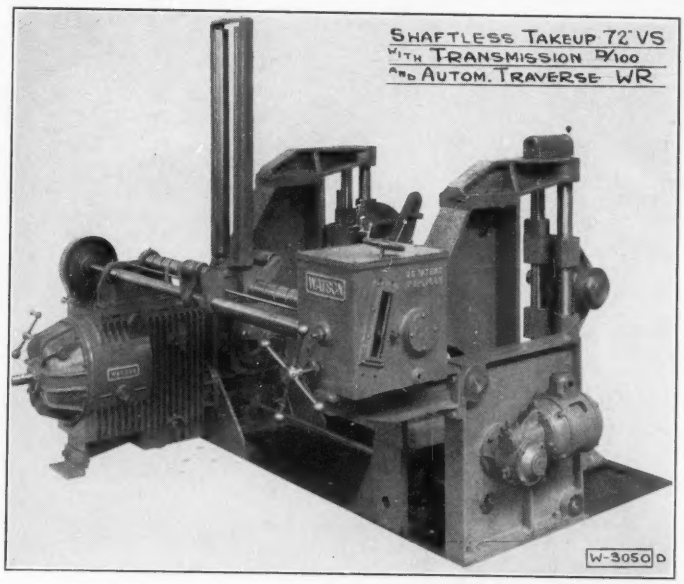

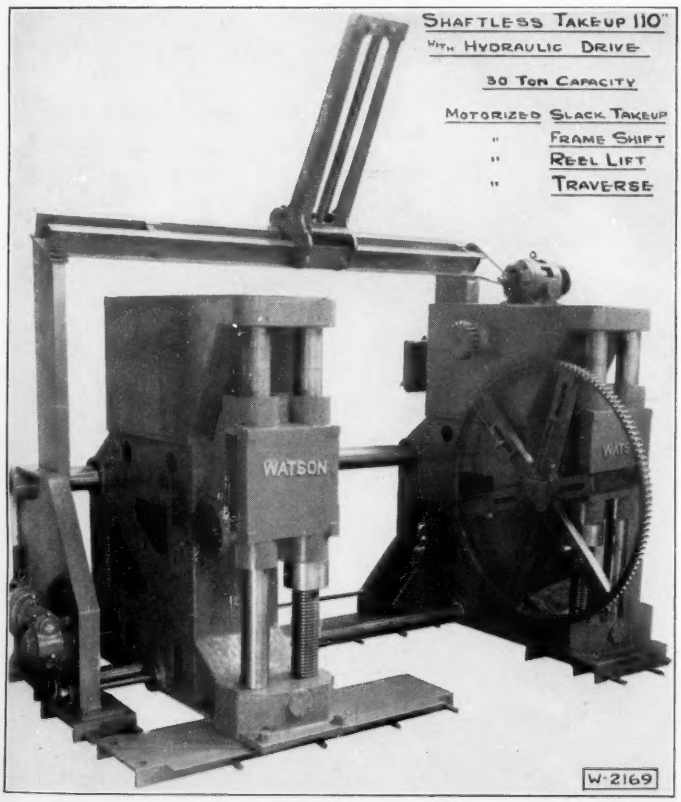

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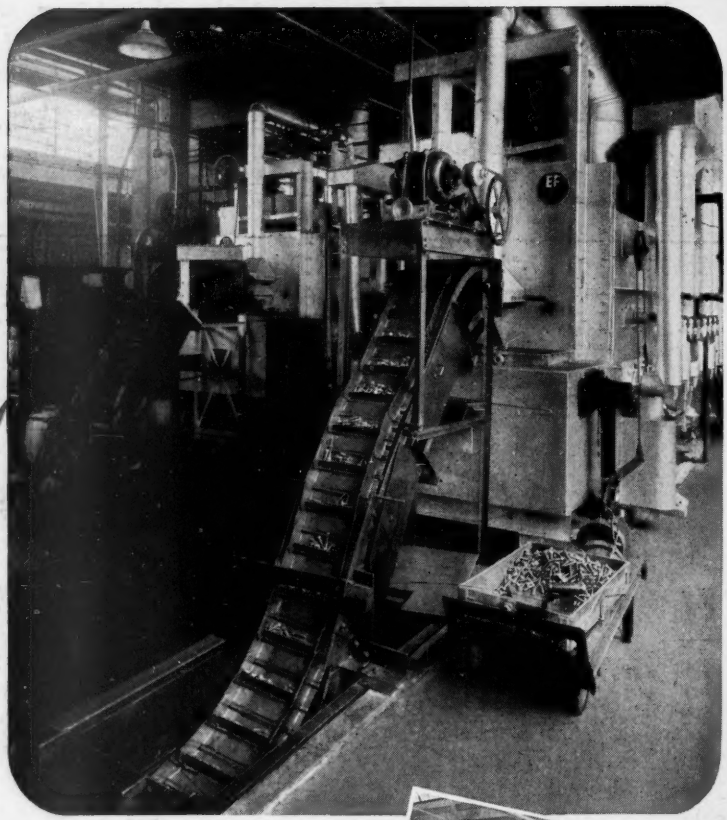

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